SIGNAL

October 1958

The NAUTILUS: There Were 2

See page 5

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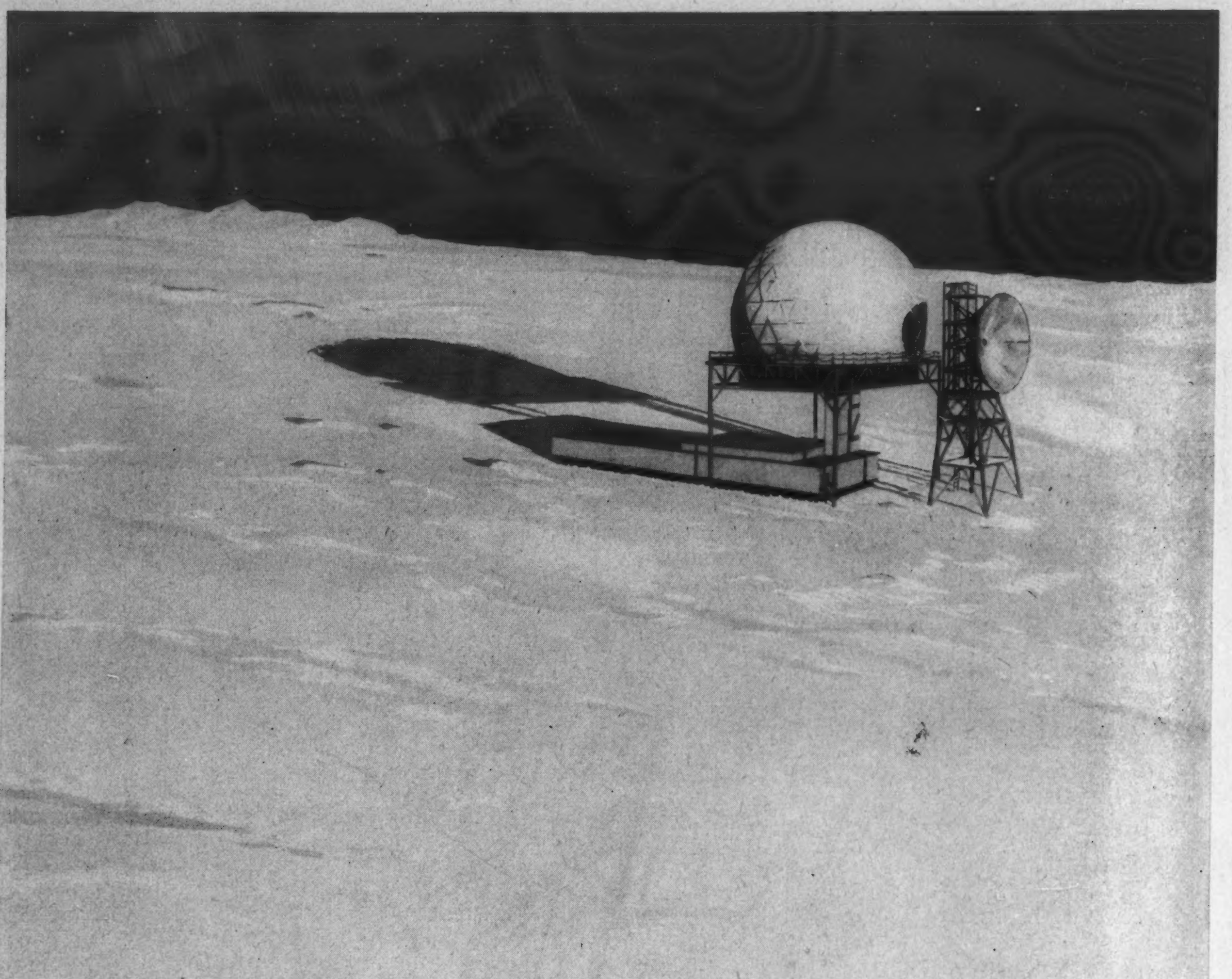

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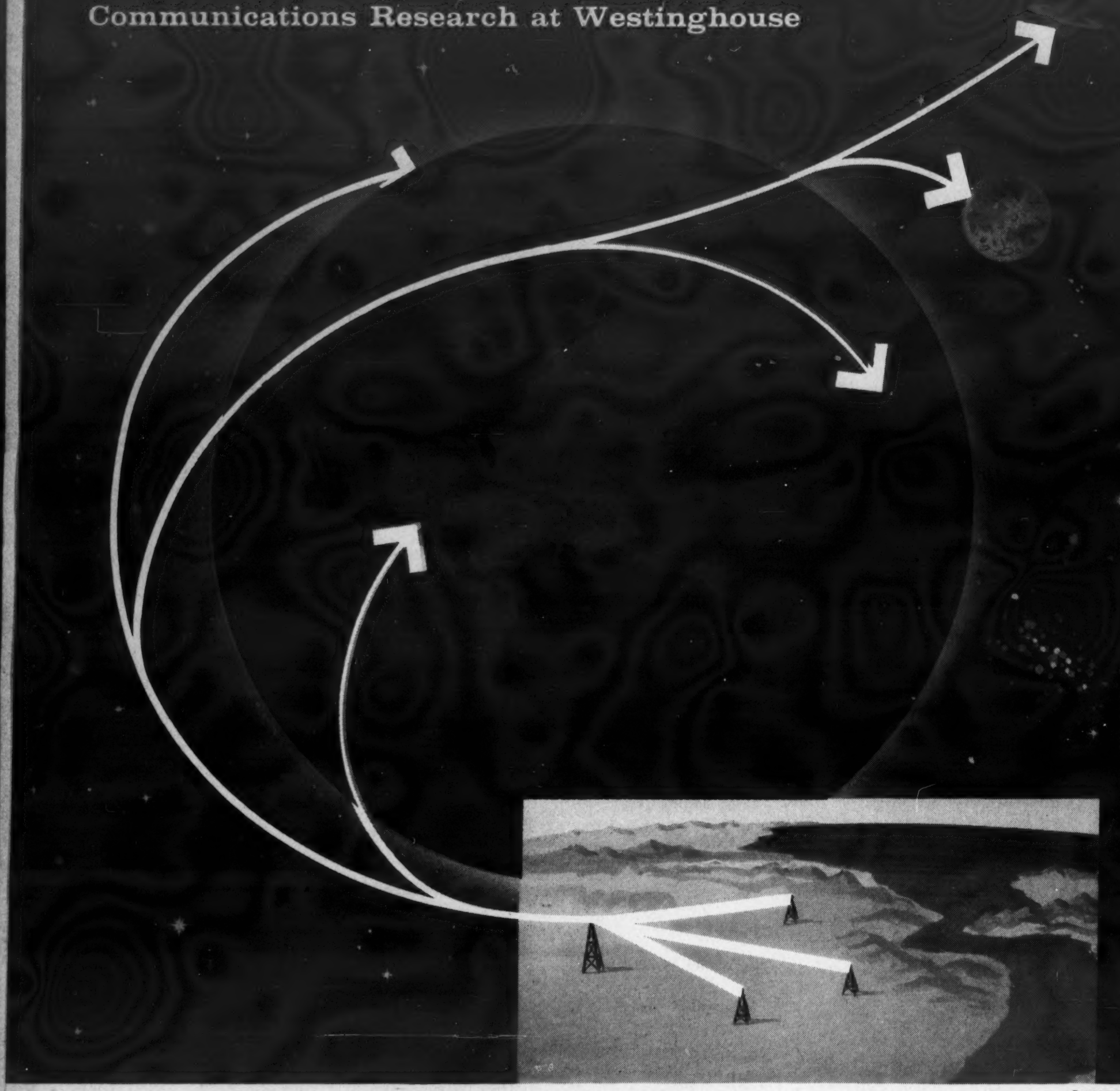
**A Stockpile Article.*

Communications Research at Westinghouse



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"For centuries the Arctic Ocean has remained almost as unmapped as the far side of the moon. In four nuclear submarine cruises—three by *Nautilus*, one by *Skate*—it has now been sounded out—ice and bottom—to such an extent that it can be used as a transocean route from Pacific to Atlantic, and as a nuclear submarine operating area of over 5 million square miles. Though much additional survey work remains to be done, the feasibility of polar operations, thanks to nuclear power, has been demonstrated." Cdr. W. R. Anderson, commanding officer, *USS Nautilus*

THE NAUTILUS

THE NAUTILUS

there were two*

the nautilus, 1931—an adventure

THE POLAR SUBMARINE *Nautilus*, her bow tanks partially filled and her propellers churning the sea just barely beneath the surface, gathered speed and headed straight for the ice. It was 0730 (GMT) on Sept. 4, 1931, and the weather outside was bitter cold.

In the navigator's log book the position had been carefully noted: 82.25 deg. north latitude; 24.00 deg. east longitude—only 462 miles from the North Pole.

Many months earlier, inverted sled runners had been welded to the topside of the converted World War I submarine for just this moment—to permit her to slide along on the bottom of the ice pack.

A hydraulic drill had been installed to permit the sub to cut a hole up through the ice large enough for a man to crawl through and to provide a snorkel through which to discharge diesel fumes while recharging batteries. A hydraulic ram had been installed in the bow to cushion the shock of hitting submerged obstacles.

Now it was time to test the theory that had brought Sir Hubert Wilkins and his fellow explorers in this frail craft thousands of miles through heartbreak and tragedy — a theory that, ironically, was destined not to be proved until recently by her atomic namesake.

Chief radio operator on that historic voyage, Raymond E. Meyers, 63, of 717 Anderson Way, San Gabriel, thumbed through his log book recently and relived that tense moment when the whole world awaited news of the "visionary fools" who set out from New London, Conn., to blaze a new seaway under the ice to to the North Pole.

"We knew before we trimmed ship for the dive that day that we already had been defeated in our real purpose for being there," Meyers, a retired Navy lieutenant commander and now California manager of radio communications for Lockheed Aircraft Co. at Burbank, said.

Diving Mechanism Lost

"Just before the dive we had discovered that our horizontal diving plane had been sheared away. We couldn't dive deeply enough to clear any possible obstructions under the ice and we had to maintain positive buoyancy lest we start to sink and keep right on going down in 2000 fathoms of water.

"It had been a heartbreaking discovery to climax a heartbreaking cruise, but we just couldn't bring ourselves to leave the ice pack without proving, to our own satisfaction at least, that it could have been done."

The *Nautilus*, her stern sticking clumsily out of the water, gathered speed until she pushed her nose beneath the ice pack. The runner on the top of the bow slid under the edge with a crash and the submarine disappeared from sight, bumping along the bottom of the ice at a speed of 5 knots.

For two and one-half hours the sub crept beneath the ice, the stump of her ice drill scraping each rough spot like the horn on a rhinoceros.

Sub Rented From Navy

In all, Meyers recalls, the original *Nautilus* pushed some five miles beneath the ice before finally surfacing in an open lead, turning around and escaping the way she had come in.

Although it was to take 27 years and the development of atomic power to prove Sir Hubert's theory of a northern passage beneath the ice, the crew of the original *Nautilus* knew in 1931 that such a voyage was possible.

A mixture of admiration for their daring and derision at their foolishness had greeted the announcement that a rusting, antiquated submarine had been rented from the Navy for $1 a year for the attempt to reach the pole.

Bad luck dogged the *Nautilus* from the very beginning. Meyers had joined the expedition on Oct. 28, 1930, as chief electrical officer and immediately found himself with the job of putting a long-neglected vessel into serviceable condition against almost impossible odds.

Oops! No Periscope

"Before she was rechristened the *Nautilus*, our sub was designated as the O-12 by the Navy," Meyers said. "Before we were through patching her up, we had parts of the old O-16, S-2, T-3 and the K-4 in her!"

On her first test dive, while still in the Hudson River, the crew discovered after the vessel was well beneath the surface that the periscope was missing (it had been removed for repairs) and the 4-inch hole left in the topside plugged with wood.

"We discovered it when the 'cork' suddenly popped out and the river began pouring in," Meyers chuckled. "We about scared the wits out of a cub reporter we had aboard, but he covered his story anyway. It wasn't until I read the article he wrote for his paper, though, that I realized just how dangerous submarines really are!"

Stuck in Mud

The first salt water test dive a short time later didn't exactly cover the *Nautilus* with glory, either. A piece of waste became stuck in the vent valve of the bow diving tanks and the sub dove to the bottom so hard she stuck 40 feet of her bow into the mud.

It wasn't until March 22, however, that real tragedy struck. Radioman Willard Grimmer was washed overboard and lost as the vessel cruised from Philadelphia to New York. It was then that Meyers, who had previous experience in the Navy, took over as radio operator.

*The following two history-making events relate to adventure and man's desire to explore and satisfy his restless spirit. This story of *Nautilus* I (1931 version) is a history-making tale, which, like many stories of the sea, becomes more exciting with age. The story of the 1958 *Nautilus* treats the Navy's communications support phase of the historical trip under the North Pole ice cap. SIGNAL Magazine is indebted to Robert Studer of the *Los Angeles Times* and our own AFCEAN Ray Meyers for the account of the 1931 *Nautilus*.

Finally, on June 3, 1931, the *Nautilus* pushed into the Atlantic from New London to begin her memorable cruise and almost immediately trouble began.

Members of the crew suddenly fell deathly ill — not seasick, something else. The sickness was traced to lead poisoning; a shipyard worker had painted the inside of the fresh water tanks with red lead.

Then on June 11, the generator on the port engine broke down. A moderate gale was kicking up white caps in mid-Atlantic and the sub pitched and rolled as Meyers and others in the crew tried to make repairs. But the sub was riding so low in the water that seas worked their way into the No. 3 piston on the starboard engine. When they tried to start it, the engine blew up.

"Finally, we used compressed air to get the port diesel going again, dragging the useless generator as dead weight," Meyers recalls. "But the load of operating the boat without our generators was such a drain on the batteries they soon were exhausted.

"The lights got so dim we almost had to strike a match to see if they were lit!"

In his tiny radio compartment forward, Meyers at last received the order that he had been expecting. "Better try to get us some help."

Sends Out SOS

Without a generator and with the main battery nearly completely discharged, there wasn't enough power to operate the sub's transmitter. But Myers, in desperation, had rewired his receiving set as a self-oscillating regenerator on which he was able to send out a call for help by tapping out Morse Code at the antenna terminal.

Meyers was awarded the annual International Gold Medal of the Veteran Wireless Operators' Association for his work that day, the first time that an American ever had received this highest award of the craft.

Battleships Get Call

He tapped out a distress signal for many hours with his rapidly failing batteries until finally, at 0803 the following day he established contact with the steamship *Independence Hall* which relayed the SOS to the battleships *Wyoming* and *Arkansas*.

Help arrived late that evening to find the *Nautilus* awash, her hatches sealed against the seas that crashed over her decks continuously. She was steering by periscope.

With the seas calmed a bit in the lee of the *Wyoming*, an attempt was made to get a line to the sub and suddenly death nearly struck for the second time. Diver Frank Crilley was washed overboard—and then washed back on board again by the next wave.

As the storm grew worse, the sub's bridge was carried away, her tow ring pulled out, even her starboard lifelines were carried away.

But just as the cruise of the *Nautilus* seemed destined to end before it had well begun, Meyers and his electricians succeeded in getting a spare generator into operation that got the boat under way again. She arrived at Queenstown, Ireland, on June 22.

Refrigerated Craft

After complete refitting, the expedition took on its party of scientists and set sail again for Norway and its big adventure at the Pole.

The frail submarine fought storms, while the cold was so biting that the inside of her hull was covered with an inch and a half of frost and looked, Meyers remembers, like the inside of a butcher's refrigerator, and the danger of puncturing her hull on the floating ice was ever present.

Ice Closes In

On August 26, at 82:05 deg. north latitude and 10:05 deg. east longitude, the ice suddenly closed in around the *Nautilus* and the crew hastily abandoned ship. Radio gear and equipment was transferred to an ice cave where the men lived for four days before the danger eased as suddenly as it began.

"We clambered back aboard and soon afterward made our first test dive in the Arctic, during which we disabled our ice drill," Meyers said.

Rendezvous With Zeppelin

"We tried going under the ice several times, but without a diving plane and with our ice drill out of commission, it just wasn't possible to go on," he added.

It had been planned to rendezvous at the Pole with the German airship *Graf Zeppelin* and Meyers was to have traded places with the radioman on the airship to prove that contact really had been made.

But the rendezvous never was kept. The log book of Radioman Meyers, however, is proof that it was a mighty near miss.

the nautilus, 1958—communications aspect

ON JULY 23, 1958, the *USS Nautilus* (SSN 571) departed Honolulu, T. H., passed under the North Pole, and arrived at Portland, England, August 12, 1958. During a good part of this historic trip in which the *Nautilus* covered 8,146 miles at an average speed of over 17 knots, its link to the White House and the Chief of Naval Operations was through the U. S. Naval Communications System.

When reading the press reports and stories published about this epic voyage, people learned for the first time that the crew had recreational facilities aboard to help them pass their off-duty hours in comfort. The thought which probably gave them the most comfort was the knowledge that they could contact some person in the United States at any time throughout the entire trip. This is a story all its own, the story of Naval Communications.

How reassuring it must have been to every member of the crew to know that if someone at home wanted to contact them during their trip from Honolulu to England via the North Pole, the Naval Communications System was there to carry the message. Try to imagine yourself under an ice pack 50 feet thick in spots for a period of 96 hours with no other ships in your vicinity. Knowing that one was all alone, attempting a feat which had never been accomplished before, not knowing what the next second held in store, must surely have made this trip an exciting experience. What if the submarine suddenly came upon a mountain ridge extending above the anticipated height! How would the rest of the world know?

The communication equipment installed aboard the *Nautilus* is the best available today. This is not meant to mean that the equipment is the ultimate that submarines like the *Nautilus* will receive. Research and development of naval communication equipment are progressing at a pace commensurate with the availability of personnel and funds. One must remember that no matter how good the communication equipment aboard may be, a receiving site properly located must be available to receive the message. This is where the Naval Communication System enters the picture. A glance at the polar presentation of the U. S. Naval Communication System will show the scope of coverage.

Let us now trace a message sent from the *Nautilus* to the Chief of Naval Operations located in Washington, D. C. This may seem an impossible task, but really it is very simple. It is like a game of football

where the quarterback has the ball and has the option of either passing by a lateral to a backfield man or attempting a long pass down field to one of his ends. Let us assume that the radioman on the *Nautilus* is the quarterback and the message he wishes to transmit is the football. If the quarterback decides on a lateral to one of his backfield men he will send the message to a naval communication facility (which is a Naval Communication Station located on foreign soil). The facility receives the message and throws a pass downfield (sends it by radio) to an end in the open (a Naval Communication Station) who carries it over the goal line (sends the message via landline to the Naval Radio Station in Washington, D. C.). If the quarterback decides to attempt a long pass to his end, that play is also possible. He simply by-passes the Naval Communication Facility and sends it direct to a Naval Communication Station which delivers it to the Naval Radio Station in Washington, D. C.

Since we have seen how it was possible for the *Nautilus* to send a message to the Chief of Naval Operations, let us now see how it is possible for the Chief of Naval Operations to send a message to the *Nautilus*.

Among the most important services rendered to the operating forces by the Naval Communication System are the primary fleet broadcasts, through which ships at sea receive nearly all of their radio messages.

There are six such broadcasts, each emanating from a certain primary center and beamed over a particular geographic area. The *Nautilus* copied only the broadcast for the area in which she was located. The stations of the Naval Communication System are informed, through movement reports, of the area in which the ship is located, and thus are able to forward traffic for the *Nautilus* to the proper communication center for transmission. On passing into a new broadcast area the *Nautilus* shifts and copies the broadcast for the new area. The broadcasts follow regular schedules, which are not changed without prior notification to the Fleet. All units copy every schedule in its entirety, but only the addressees of a message take action on it.

To insure reception by all units (which includes the *Nautilus*) in an area, the primary stations employ several transmitters simultaneously. Broadcasts are sent out on a multiplicity of frequencies.

Ships copying the broadcasts do not indicate in any way that the traffic has been received. In this way communication is maintained while allowing the *Nautilus* to preserve radio silence.

Similarly, hydrographic information, merchant ship traffic information, weather forecasts, time signals, press broadcasts, etc., are obtained daily from the general broadcasts.

To fully understand how effective communications were maintained between the *Nautilus* and Washington, Honolulu and New London, one must look at the polar chart of the U. S. Naval Communication System and realize the vast intricate network, the equipment and the personnel necessary to give communication support not only to the *Nautilus* but to all other activities of the United States Navy. From this it can be seen that communications between the *Nautilus* and the rest of the world were not dependent upon any one individual circuit but on a vast network of stations and circuits. Actual transmissions from the *Nautilus* during this historic trip were received by several of the Navy's stations located throughout the world.

The U. S. Naval Communication System has again demonstrated its ability to serve the fleet on its missions throughout the world. Whether the operation is a routine one off the coast or a trip under the polar ice cap, the U. S. Naval Communication System stands ready to fulfill its mission of providing and maintaining reliable and secure communications for the United States Navy.

The following remarks were made by Cdr. W. R. Anderson, at the National Press Club, Washington, D. C. — September 5, 1958

Polar operations by submarines, involve two distinct problems—the first, navigation—the second, surfacing in the ice pack.

• In navigation there are three elements—ice thickness, water depth, and the precise calculation of position along the earth's surface.

With the inertial navigator and precision high latitude gyro compasses the problem of position determination has been solved to a very substantial degree.

Ice thickness is another matter. During last year's short Arctic trip we were fitted with a very crude equipment for measuring ice thickness and tracing the under-ice profile. This year, thanks to the Navy and Dr. Lyon, we have a much better device. The record this year showed two things: one, that the under-ice profile is fantastically rugged—far more so than anyone ever suspected—and second, that there is, stating it plainly, a lot more ice up there than anyone has estimated. However, even from the ice thickness standpoint the picture for Arctic submarine operations is encouraging because nowhere did *Nautilus* find it more than a mere fraction of our operating depth capability.

Water depth in the Arctic is a matter to dwell upon, too. Though it was disconcerting on our trip to find errors of over one mile between estimated and actual water depth, the basic features of the Arctic basin were confirmed. Throughout it is a very deep ocean—with deep approaches from the Atlantic side, shallow approaches from the Pacific side.

• Now for the second of the two basic submarine problems — that of surfacing—or as Jules Verne phrased it—of regaining the atmosphere.

In a nuclear submarine the ability to surface routinely is not vital unless there is an important job to do on the surface—like firing missiles.

As you know there is always a small amount of open water in the ice pack. Sometimes the openings are large—sometimes mere cracks.

The job of maneuvering three or four thousand tons of submarine into one of these openings is not, strictly speaking, routine. Last year we did the world's best job of demonstrating how not to do it, and we brought back physical evidence to prove it, two damaged periscopes (one later repaired at sea) and a crushed upper superstructure. Later, and this year prior to our shot across the basin, we were more successful. *Skate* has concentrated on this problem with a very great degree of success — witness her surfacing beside the manned ice island.

The surfacing problem then looks promising of full solution too . . . . . in a ship with the performance and reliability of nuclear power it is possible to do almost anything. The horizons for our nuclear Navy are truly broad — in the Arctic, and all the oceans . . . in the air, on the surface, and below the surface . . . day in and day out . . . peace time, wartime . . . little wars, big wars."

Teleprinted Communications . . . on the double!

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Day after day, Kleinschmidt teletypewriters and related equipment at U. S. Army Communication Centers receive and transmit thousands of teleprinted messages. This tremendous communications traffic, accelerated by multiple-function Kleinschmidt equipment, developed in cooperation with the U. S. Army Signal Corps, flows smoothly and precisely. Both sender and recipient receive a teleprinted original, identical in every respect.

Since the century began, the Kleinschmidt name has been associated with every major development in teleprinted communications. Now a member of the Smith-Corona family, Kleinschmidt looks ahead to new attainments in broadening the field of electronic communications for business and industry.

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Pioneer in teleprinted communications equipment • A subsidiary of Smith-Corona Inc

Figure 1—Standard 4 x 3 ratio screen (see Figure 2 for comparison)

"WIDE SCREEN"

television's new dimension

TELEVISION, with its ability to overcome the limitations of distance to "see" in spite of imminent danger and to explore otherwise inaccessible places, is present warfare's modern communications device extending substantially the range of normal vision. Indeed, modern warfare with its furious pace, its insatiable thirst for instantaneous information would be blindly fought without the efficient utilization of this modern marvel.

In a different but no lesser degree, the same need for the extension of human vision exists in civilian pursuits. Both military and civilian minds have applied themselves to devise practical, time-saving, and unique appliciations of television in their respective fields.

If the familiar television with its 4 by 3 picture aspect ratio has served both fields well till now, it is evident that this is only a beginning. Even now, television is being called upon to handle tasks that are beyond the scope of the 4 by 3 frame.

There is an increasing need to concentrate the observable information in a desired direction, and to require more of it on the monitor screen. Thus the new concept of what is called *wide screen* television appears, in which the aspect ratio is developed to approximately twice that of ordinary television. This means that the information transmitted is *twice as much* as under the normal EIA* standards. (*See Figs. 1 & 2 for comparison*)

In the wide screen television system, the maximum information is concentrated along the meridian of interest. This makes it possible in usual applications for information per solid-angle of field to be 75% greater than normal.

*Electronic Industries Association.

A Major Advance

Wide screen TV represents a major, and probably the most important advance in the television art in recent years. While the method is similar to the anamorphic process developed for motion pictures, it is not identical with it. Both optical and electronic problems had to be solved to achieve the successful wide screen TV system under discussion here.

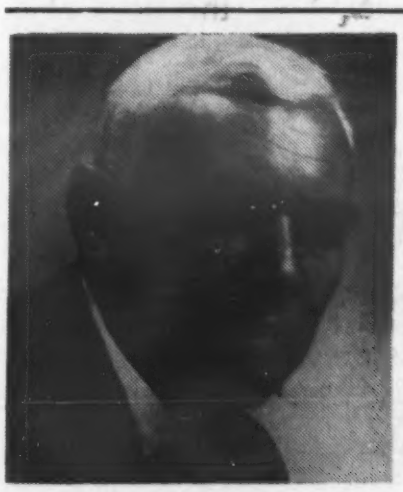
With its three separate pieces of electronic apparatus interconnected by cables—camera, control monitor, and power pack—and arranged to present a closed circuit TV picture on EIA standards of 525 lines, 60 fields, 30 frames and 2:1 interlace (except for aspect ratio), the system does not differ from the present closed circuit techniques in form and practice.

Choosing an anamorphic factor of 2 (in keeping with motion picture procedure), the aspect ratio of the unsqueezed image can be 7 to 3 (consistent with Cinemascope) which requires that 175% of the amount of information of a normal 4 by 3 TV picture be transmitted. To avoid degrading the horizontal resolution, the bandwidth of the video amplifier had also to be expanded by a factor of 175%. With EIA standards requiring a bandwidth of 4.5 mc. for 400-line TV resolution, a bandwidth of at least 8 mc., is required to produce the 700 lines needed in the wider picture. A bandwidth of 10 mc. serves to increase the contrast in the detailed regions.

The wide screen presentation is on a picture raster approximately 19 inches by 8⅛ inches in black and white. A maximum azimuthal field of view of 77 degrees and a 33-degree maximum elevation field are provided. These are interchangeable if camera and monitor are rotated through 90 degrees.

If for example, a 75-foot Vanguard Rocket is observed by a camera equipped with a D-model anamorphic, backed up by a 20mm. prime lens, at a fifty-foot distance one inch of the rocket will correspond to approximately one picture element on the viewing screen under optimum conditions. The angular field is one degree per foot-of-subject at this distance, and with lens at infinite focus.

Various lens combinations are available. The Scanoscope lens represents the finest anamorphic lens system to date both optically and mechanically. It can be coupled with standard lenses from 20 to 100mm. and be driven by a unitary motion.



by **MADISON CAWEIN**
Vice President
in Charge
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The entire system is packaged in a compact unit only 5" high, 10½" wide, 22" deep, and weighing only 47.5 lbs. Individual modules can be separated up to distances of several feet without any adverse effect on performance.

The equipment is designed to meet the rigorous environment of the high-performance aircraft of today and tomorrow. Its operating ambient temperature range is −60 to +125 degrees C. at altitudes up to 70,000 feet. Widespread use of semiconductors in the ILS receivers and TACAN circuitry means high reliability, small size and low power consumption.

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Complete technical details on the NAVTAC system are available on request.

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Figure 2—Scanoscope wide screen 7 x 3 ratio

The mechanical arrangement is such that the camera lens motion and that of the anamorphic are combined.

Some Military Applications

Wide screen pictures can be in the 7 to 3 ratio, as in the Cinemascope motion picture; or they may be wider —say, 9 to 3 ratio. The bandwidth required is approximately 10 mc., in order to obtain the maximum information available in a 525-line, 60 field interlaced picture.

A good value for a military or civilian field aspect is a 7 to 3 ratio concentrated horizontally rather than vertically. In one application the angular field might be 72 degrees in azimuth and 31 degrees in elevation; and the distribution of information will be 4.5 Kc/circular degree with a solid angle of 2,232 circular degrees. Such a field of view would be suitable for observing a battle terrain or a seascape, a football field or a theater stage.

Wide screen television's superiority over the conventional method will be apparent at once, when it is considered that to encompass this azimuth of 72 degrees along the horizontal meridian with the usual 4 to 3 ratio, 54 degrees in elevation would have to be covered. The solid angle would be 3,888 circular degrees, and the information would be only 2.5 Kc/circular degree.

It is obvious that the 4 to 3 ratio wastes information in the unwanted elevation: as in the sky, or sea, rather than on the horizon. Even with 10 mc. transmission in both systems, the information per circular degree of field would be 75 percent greater with the wide screen ratio.

With this fact of expanded resolution in the field of interest, it will be seen that wide screen TV military applications are indeed numerous. For example, if TV were being used to monitor a tank action, the command that has access to the monitor can watch the flanks in more detail, without distractions in the foreground.

In the case of a beach landing, *seventy percent more* of the horizon would be available for observation than with the old-style monitor. Another interesting application of wide screen TV is in connection with the launching of rockets and missiles. In this case the meridians would be re-

(*Continued on page* 12)

versed to present an expanded elevation field allowing a closer inspection of the regions to be observed due to the *shape* of the object.

For the shape of military objects —such as ships, guns, target areas, buildings, planes or battle lines—is usually quite rectangular. The rectangle also is usually, but not always, arranged with its long dimension on the horizon. Furthermore, the aspect ratio of our vision is more nearly 7 to 3 than 4 to 3, due to the horizontal arrangement of the eyes. Thus wide screen TV gives a more usual field of view than the 4 to 3 picture does.

Observations From Satellites

For remote observations from satellites, it has been proposed to use television. In such observations, it would be advantageous to extend the field of view in the direction of motion, particularly because of the high speed of travel on one meridian. Optical arrangements could be used to hold the extended field stationary periodically, as in aerial photography. It would be possible to obtain a detailed close-up of the surface of our moon, much more detailed than with any existing telescope, by equipping a moon-rocket with wide screen TV cameras and a 20 kw transmitter. The far side of the moon could be observed from Earth *by this means only*, perhaps requiring an advance (or trailing) relay rocket-transmitter, to avoid the radio shadow of the moon.

In nuclear propelled vehicles, the nuclear reactors employ remote controlled mechanisms which cannot be observed directly because of radiation hazards. In such installations, it would be preferable to cover the angular field by wide-angle, wide screen TV than by the use of pan or tilt mechanisms which complicate the system and introduce an increased factor-of-failure. By these means the field can be expanded horizontally without loss of resolving power vertically.

Security and Surveillance

Wide screen TV has obvious advantages over panning mechanisms for security observations along fences, at gateways and for inspection and safety surveillance. The mechanical panning mechanism always leaves part of the field unobserved for brief intervals toward the end of each panning cycle. These could be the crucial intervals.

Another natural application of wide screen TV is in aviation—for the observation of take-off and landing operations on air-fields or carriers. The arrangement of planes on the air-strip, or their motion, is horizontally extended, so that the 7 to 3 ratio is more suitable than the 4 to 3 aspect. It should be borne in mind that for special military applications, the 7 to 3 ratio could be extended to 15 to 3, or 5 to 1, giving a 75-degree by 15-degree field of view, if vertical information is not too important. A 3 to 1 field might be more useful since it would impair the vertical resolution but slightly, while allowing observation of an entire carrier deck with good detail.

Standards for the Future

In civilian usage it now is obvious, since the success of wide screen motion pictures, that an increased aspect-ratio standard would be preferable to the present standard. Today's TV standard was originally proposed because it followed the old moving picture 4 to 3 aspect ratio. Now that the grade-1 stockpile of anamorphic films is growing, it becomes important to review our commercial standards for the future.

Let us consider the televising of sports events. In every sport that is

played on the ground or in the water, such as hockey, tennis, polo, football, basketball, swimming events, track, the action is extended horizontally. Racing tracks, ball fields, parade grounds, tennis courts, golf courses, bowling alleys are all extended in the horizontal plane. From the standpoint of the spectator, a 7 to 3 ratio is to be preferred over the 4 to 3.

In the theater also, the natural aspect of the stage is about twice that covered by commercial television. This is because the actors are usually performing side by side, and not on one another's shoulders. If there are more than four players in a scene, it is extremely difficult for them to get into a scene showing a TV close-up without a sense of crowding. And in the case of TV's so-called "spectaculars" involving large choruses, performing on a full stage, the depth of picture is such in ordinary TV that much screen-presentation of the performance is wasted in high backgrounds, or in meaningless foregrounds.

Wide screen transmissions of stage, concert, arena events that are naturally broad in scope would be favored by the viewer over the narrower presentation available on the 4 to 3 commercial TV screens. That is, the wide screen presentation would be nearer to what the eye would see if the viewer were at the event in person.

Further Applications Unlimited

In business, industry and the arts, there are unlimited uses and applications for wide screen television. Traffic moving along horizontal lines—as in railroad yards; at road intersections; or in loading and unloading areas—will find definite advantages in wide screen observation possibilities.

With production lines lengthening in this era of automation, production flow-control requires instantaneous checking at many points from a single observation post—possibly by means of the extended viewing-potential of wide screen TV.

Monitoring of processes too dangerous or critical; remote test watching; observing medical experiments or operations, or lecture-room laboratory demonstrations—all these and many more will find the increased information made available by wide screen TV valuable and important.

In transmitting data such as facsimiles of checks or credit records in banks, with information reading in the long direction; or in continuous monitoring of recording-instrument bays aligned horizontally on instrument panels, the wide screen presentations are to be desired over the smaller 4 to 3 aspect picture with their lesser information.

Recently the word "weathervision"* has crept into electronic terminology, and it is easy to understand why: Weather data being of such prime importance to both civilian and military aviation, any means providing rapid information visually about weather conditions is a necessity. With its inherent capability of almost doubling the amount of useful information on the monitor screen, the Scanoscope wide screen system would provide flying personnel with a more improved device for its weather briefing periods than any available thus far.

This is true of course of any application in which it is either desirable or necessary to see more in one direction—i.e.: in the horizontal meridian—than in the vertical, when objects lie in their normal horizontal position. For vertical objects, as in missile projection, a 90-degree shift of equipment would afford the same advantage.

*See "Weathervision," June 1958 SIGNAL.

Two *NEW* Teletype tape

TAPE PUNCH

Teletype Model 28
Typing Reperforator

TAPE READER

Teletype Model 28
Transmitter-Distributor

units speed work, cut costs

More uniform work loads, greater accuracy, lower cost, faster handling, greater operating efficiency in:

• sales, sales analysis, warehousing, accounting, purchasing, production control, shipping, receiving, manufacturing;

• communications, data processing, automation and paperwork simplification.

These new punched tape units offer you the opportunity of extending your communication and business systems into new departments at a relatively low cost. They can be used individually . . . or in combination with other Teletype equipment . . . or with such business machines as computers, calculators and card punches.

All advanced Teletype Model 28 features —operation at 100 words per minute, handsome styling, compactness, extremely quiet operation, modular design, metal clutches that require oiling only once or twice a year.

TAPE PUNCH • The Teletype Model 28 Tape Punch is a receiving unit—for message relaying in communication systems . . . integrating data from several sources into a single tape . . . monitoring . . . by-product tapes.

Features and Specifications:

1. Receives incoming sequential signals and translates them into punched code combinations in tape.
2. Types corresponding characters on the tape.
3. Provides facility for parallel-wire output of incoming signals, with simultaneous punching of tape, for control of external equipment.

Speed 100 wpm (or lower speeds where required for compatibility with existing systems). Produces chadless (partially punched) 5-level code tape, 11/16" wide. Prints on tape. Dimensions, a compact 9½" high, 13" wide, and 14⅛" deep.

TAPE READER • The Teletype Model 28 Tape Reader is a transmitting unit. When punched tape is fed into the unit, it "reads" the code combinations and automatically sends them to their destination. Serves as a sending unit in communications systems . . . read-out device for business machines . . . control mechanism for automated equipment.

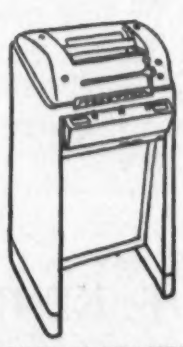
Features and Specifications:

1. Translates code in perforated tape into electrical impulses for sequential transmission.
2. Translates code in perforated tape into electrical impulses for parallel-wire transmission.
3. Receives electrical impulses from external parallel-wire source and translates them for sequential transmission.

Operates at 100 wpm (lower if required). Handles chadless or fully punched tape. Dimensions 6½" high, 9" wide, 16" deep.

MORE INFORMATION • For descriptive literature on the new Punch and Reader—or other units in the Teletype Model 28 line—please write to Teletype Corporation, Dept. 71K, 4100 Fullerton Avenue, Chicago 39, Illinois.

MODEL 28 PRINTER, SEND & RECEIVE



MODEL 28 PRINTER, RECEIVE ONLY

MODEL 28 ASR COMPOSITE SET

TELETYPE®
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after the "gap"—what?

editor's note:

In making the following article available to SIGNAL Magazine, Senator Kennedy (D.-Mass.) has provided our readers with a realistic appraisal of the issues relating to our national security.

FOUR hundred years ago the British crown and people realized with a sense of shock that they had lost Calais forever. Long considered an impregnable symbol of British supremacy in Europe, this last foothold of English power on the continent was surrendered to the French in 1558. It is said that when Mary of England died, in that same year, the word "Calais" was engraved upon her heart—but that she was, in the words of *The Cambridge Modern History*, an eminent example "of the inadequacy of deep convictions and pious motives to guide the state aright." Once they had recovered from their initial panic, the British set about adjusting their thinking and their policies to the loss they had suffered. With their gateway to the continent gone, they sought new power and influence in the seas. A navy was built, new trade routes promoted, a new maritime emphasis established; and when the Spanish Armada was defeated in 1588, the panic and pessimism that had followed the loss of Calais were forgotten as Britannia ruled the waves. The old power, the foundation for old policies, was gone —but new policies had brought a new power and new security.

The time has come for the United States to consider a similar change if we, too, are to depend on something more than "deep convictions and pious motives to guide the state aright." For we, too, are about to lose the power foundation that has long stood behind our basic military and diplomatic strategy.

The Deterrent Ratio

That foundation—one of the key premises upon which our leaders of diplomacy, defense and public opinion have based their policy thinking —has been, since Hiroshima, our nuclear power. We have possessed a capacity for retaliation so great as to deter any potential aggressor from launching a direct attack upon us. Spokesmen for both parties, here in the Senate and elsewhere, have debated our preparedness upon the assumption that this "ultimate deterrent" would deter any Soviet attack. Our retaliatory power, said the President in his 1958 State of the Union Message, is "the most powerful deterrent to war in the world today," offering any potential aggressor "the prospect of virtual annihilation of his own country." Possession of similar striking power by the Soviet Union has not altered this basic premise — it is instead described now as the result of a "nuclear stalemate," a point of mutual "saturation" or a "balance of terror."

The hard facts of the matter are that this premise will soon no longer be correct. We are rapidly approaching that dangerous period which General Gavin and others have called the "gap" or the "missile-lag period"—a period, in the words of General Gavin, "in which our own offensive and defensive missile capabilities will lag so far behind those of the Soviets as to place us in a position of great peril."

The most critical years of the gap would appear to be 1960-1964.

This is not to say that during that period we will not retain a nuclear capacity sufficient to rain "virtual annihilation" upon the U.S.S.R. But in view of our unwillingness and inability to strike the first blow, the successful use of that capacity—and the prospects for success must be overwhelming to deter a Russian attack—actually depends upon the proper balance of six factors:

(A) *The striking power of the Soviet Union* that could be brought to bear upon our retaliatory power in a surprise attack. In the years of the

by SENATOR JOHN F. KENNEDY

gap this will rest primarily upon their missiles—IRBM's and ICBM's.

(B) *The adequacy of American defenses* to reduce the successes of that Soviet striking power. This will include our distant early warning system, anti-missile missiles when available and other interceptor and defense devices.

(C) *The vulnerability of American retaliatory power* to destruction by any Soviet weapons penetrating our defense. Exposed missile bases and planes wing-to-wing on the ground are prime examples of this factor; although in a sense it also covers our "destruction tolerance"—the amount of devastation we could endure and still fight back.

(D) *The retaliatory power of the United States,* its size affecting the amount of such power remaining and available after the initial Soviet attack.

(E) *The adequacy of Soviet defenses* to reduce the success of our retaliation.

(F) *The vulnerability of the Soviet Union and its tolerance of destruction,* as a measure of what the Soviets will still be able and willing to do after our retaliation.

In short, what might be called the deterrent ratio—in terms of a somewhat oversimplified mathematical formula—requires that the sum of (A), (E) and (C) be no greater than the sum of (D), (B) and (F)—if we are to have a stalemate. But as the missile striking power of the Soviet Union increases and our retaliatory power lags—as the adequacy of our continental defense falls behind that of the Soviets—as we fail to reduce sufficiently the vulnerability of our attack installations and planes, as contrasted with the wide dispersal of Soviet-Red Chinese power—and uncertain as we are about the destruction tolerance of our people whose political institutions and way of life are not prepared by tradition for the devastation of battle, again unlike the Soviets—*then we must realize that the deterrent ratio during 1960-1964 will in all likelihood be weighted very heavily against us.*

These are not easy facts to face—and once faced, their implications are not easily comprehended. But the facts must be faced—and soon. Our peril is not simply because Russian striking power during the years of the gap will have a slight edge over us in missile power. They will have several times as many—intermediate range missiles to destroy our European missile and SAC bases, and intercontinental missiles to devastate our own country, installations and government, and history's largest fleet of submarines and possibly long-range supersonic jet bombers, to follow up this advantage. If by that time their submarines are capable of launching missiles, they could destroy 85% of our industry, 43 of our 50 largest cities and most of the world's population.

We shall have no such supply of missiles with which to retaliate—particularly after our few exposed IRBM bases in Europe and the Mediterranean are attacked. We have not yet even successfully completed a test of our Atlas or Titan ICBM's, while Russian test successes are now established. Progress on what appears to be one of our best hopes, the Polaris, has lagged and I understand may even now be threatened by a possible Defense Department order impounding the extra funds for this work voted by the Senate. We shall rely to a great extent on manned bombers—bombers which face a problem of sufficient alert and sufficient dispersal to avoid decimation, particularly if current Middle East trends should curtail our base operations in that area—bombers that lack an adequate refueling system to penetrate Soviet borders without some two to four refuelings from our inadequate tanker supply.

Even then we shall encounter a Soviet air defense, and dispersal or concealment of vulnerable power, far superior to our own—a margin, according to some estimates, which the Soviets will be able to maintain at a level of two to four times greater than our own. Indeed, our own DEW Line and other continental defense bulwarks—many of which the Soviets will hope to knock out before or during the first blow—were planned for manned bombers and must be redesigned and rebuilt before they are adequate for the missile age.

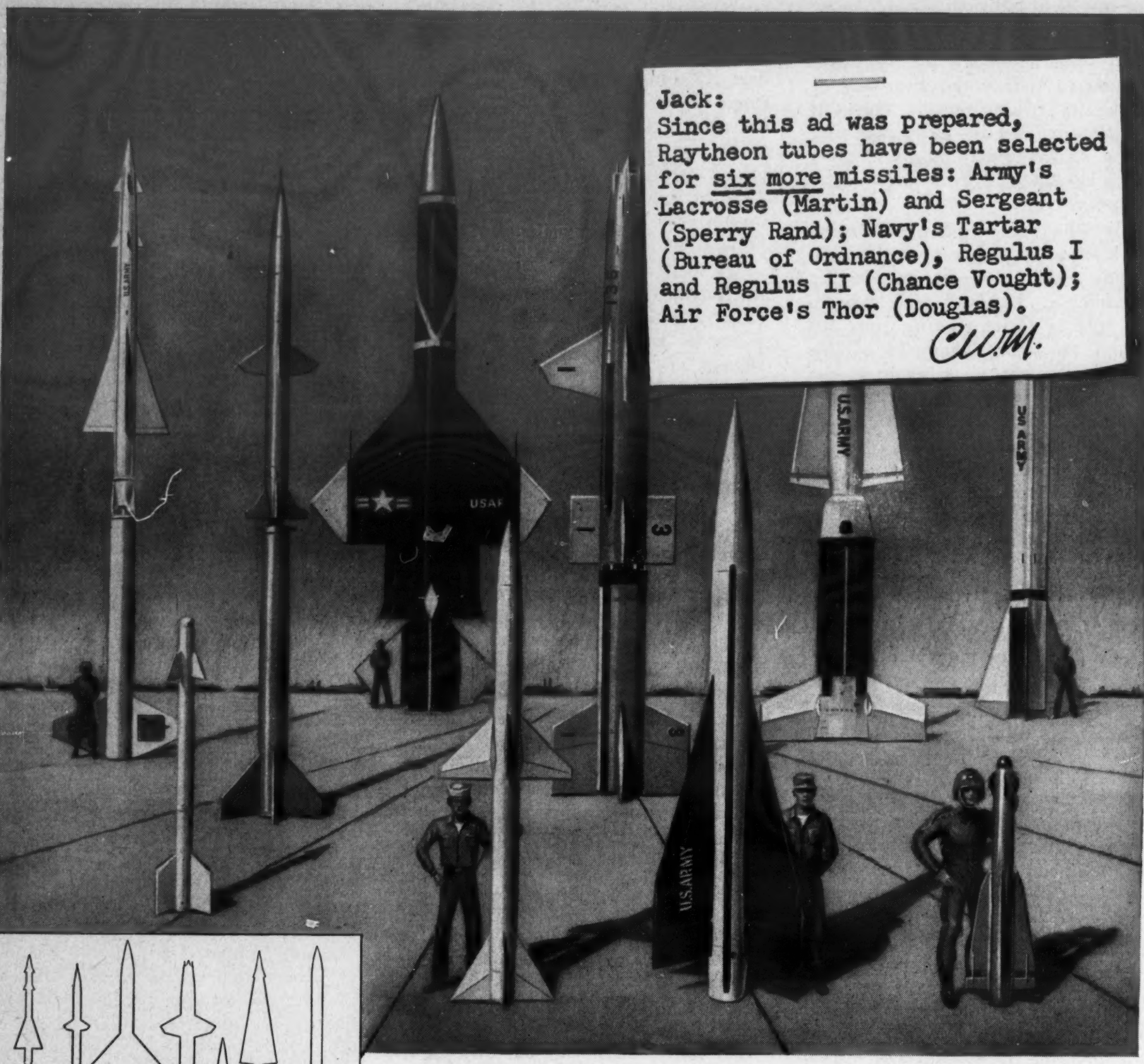
In short, the deterrent ratio might well shift to the Soviets so heavily during the years of the gap as to open to them a new short cut to world domination. A portion of their homeland will still almost inevitably be destroyed, no matter how great their defenses or how decimated our retaliatory power. And without doubt world opinion would not tolerate such an attack. But our experience with the illogical decisions of Adolph Hitler should have taught us that these considerations may not deter the leaders of a totalitarian state—particularly in some moment of recklessness, panic, irrationality or even cool miscalculation.

There are possibilities of serious miscalculation — of war by inadvertence — of both sides being caught in a course that leads to an all-out war neither originally contemplated — of a bluff being called or a limited war suddenly spreading. Surely we should realize that these are very real possibilities if we but recall the Soviet Union's miscalculations of the Red Chinese reaction in 1951, our near-intervention at Dien Bein Phu in 1954, the Soviet threats of rocket war at the time of the Suez invasion in 1956 and the possibilities of massive intervention by both sides which Iraq would have posed this year had that struggle continued for any duration. We have been living on the edge of the crater for many years now. We know full well the lack of communications between ourselves and our adversaries, the mutual suspicion and hostility, the increased risks taken by the Soviets as their striking power grows. Let no one think, therefore, that a Soviet attack, inadvertent or otherwise, is impossible because of the H-bomb damage we would still hope to rain upon them.

The Soviets, moreover, will be well aware of their advantage during the years of the gap as we. *We cannot expect them to sit idly by and make no profitable use of it while we strive to catch up* (and if General Gavin is correct in estimating Russian lead time to be twice as short as ours, five years as compared with ten, we may not even catch up in 1964 or thereafter). We cannot expect them to give us the same advantage we gave them during the years of our atomic monopoly, by sitting by until our missile power equals their own.

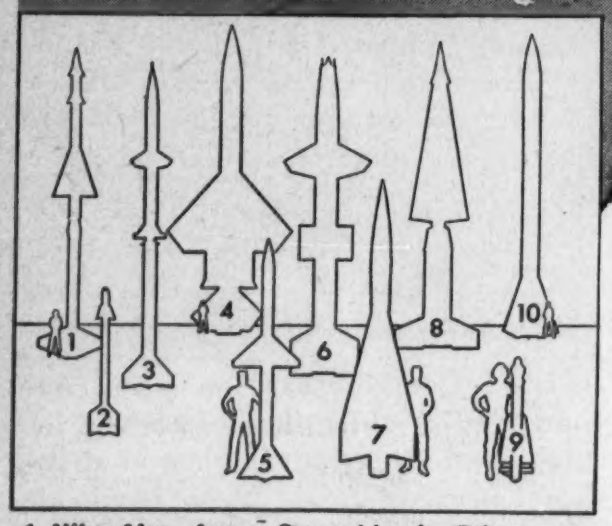
The Non-Nuclear Threat

But nuclear destruction is not the only way in which the Soviets will be able to use their advantages in striking power. War is not so much an objective of foreign policy as an instrument—a means of securing power and influence, of advancing a nation's views and interests. In the years of the gap, *the Soviets may be expected to use their superior striking ability to achieve their objectives in ways which may not require launching an actual attack.* Their missile power will be the shield from behind which they will slowly but surely advance — through "sputnik diplomacy," limited brush-fire wars, indirect, non-overt aggression, intimidation and subversion, internal revo-



Jack:
Since this ad was prepared, Raytheon tubes have been selected for six more missiles: Army's Lacrosse (Martin) and Sergeant (Sperry Rand); Navy's Tartar (Bureau of Ordnance), Regulus I and Regulus II (Chance Vought); Air Force's Thor (Douglas).

C.W.M.



1. **Nike Ajax.** Army. Ground-to-air. Prime contractor: Western Electric.
2. **Sidewinder.** Navy. Air-to-air. Prime contractors: Philco; General Electric.
3. **Terrier.** Navy. Surface-to-air. Prime contractor: Convair.
4. **Bomarc.** Air Force. Ground-to-air. Prime contractor: Boeing.
5. **Sparrow III.** Navy. Air-to-air. Prime contractor: Raytheon.
6. **Talos.** Navy. Surface-to-air. Prime contractor: Bendix.
7. **Hawk.** Army and Marine Corps. Ground-to-air. Prime contractor: Raytheon.
8. **Nike Hercules.** Army. Ground-to-air. Prime contractor: Western Electric.
9. **Falcon.** Air Force. Air-to-air. Prime contractor: Hughes Aircraft.
10. **Corporal.** Army. Ground-to-ground. Prime contractors: Firestone; Gilfillan.

10 MAJOR U. S. MISSILES RELY ON RAYTHEON TUBES

Crushing acceleration and searing heat must be endured by the electronic tubes in guided missiles. Even under these grueling conditions, tiny Raytheon tubes produce guidance impulses with steadfast *reliability*. This reliability is achieved through capable engineering and painstaking manufacturing and testing techniques.

The choice of Raytheon Reliable subminiature tubes for use in these 10 missiles is another example of how the 31,000 men and women of Raytheon are contributing to the nation's security.

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lution, increased prestige or influence, and the vicious blackmail of our allies. The periphery of the Free World will slowly be nibbled away. The balance of power will gradually shift against us. The key areas vital to our security will gradually undergo Soviet infiltration and domination. *Each such Soviet move will weaken the West—but none will seem significant enough by itself to justify our initiating the nuclear war that might destroy us.*

A direct Soviet attack may be our *greatest danger* throughout the years of the gap. But it is these other avenues of Soviet advance—with a thrust more difficult to interpret and oppose, yet ending inevitably in our isolation, submission or destruction—that may well constitute the *most likely threat.*

Four hundred years ago the English lost Calais. That event altered the course of British diplomatic and military policy and changed the direction of British public opinion. The acceptance of the loss, and the adjustment of policy, were not easily or quickly accomplished—but they were eventually successful. In 1960, there is every indication that the United States will have lost its "Calais"—our superiority in nuclear striking power. If we act now to prepare for that loss, and act during the years of the gap with both courage and prudence, there is no reason why we, too, cannot successfully emerge from this period of peril more secure than ever.

The Need For A New Approach

Unfortunately our past reliance upon massive retaliation has stultified the development of new policy. We have developed what Henry Kissinger has called "a Maginot-line mentality" — a dependence upon a strategy which may collapse or never be used, but which meanwhile prevents the consideration of any alternative. When that prop is gone, the alternative seems to many to be inaction and an acceptance of the inevitability of defeat. After all, once the Soviets have the power to destroy us, we have no way of absolutely preventing them from doing so. But every nation, whatever its status, needs a strategy. There are always courses of action preferable to other courses of action—and there are alternatives to all-out war or inaction.

But the adjustment is made more difficult by our traditional failure to link our national strategy and thinking to our military status. *We have extended our commitments around the world without regard to the sufficiency of our military posture to fulfill those commitments.* Changes in our defense status are rarely reflected in our diplomatic policies, pronouncements and planning. The State and Defense Departments negotiate with each other at arm's length like so many Venetian envoys, without decisive leadership to break through the excess of bureaucratic committees, competition and complacency. We think of diplomacy and force as alternatives to each other—the one to be used where the other fails — as though such absolute distinctions were still possible.

And now today, we are approaching the years of the gap as though the situation were normal and other assumptions unchanged — or, in some quarters at least, as though this were a problem of arms alone. Nothing could be further from the truth.

In the years of the gap, *our threats of massive retaliation will lose most of their impact.*

In the years of the gap, *our exercises in brink-of-war diplomacy will be infinitely less successful.*

In the years of the gap, *every basic assumption held by the American public with regard to our military and foreign policies will be called into question.* Among the assumptions to be invalidated will be the following ten which are probably most fundamental to our thinking in the 20th century:

(1) American arms and science are superior to any others in the world.
(2) American efforts for world-wide disarmament are a selfless sacrifice for peace.
(3) Our bargaining power at any international conference table is always more vast and flexible than that of our enemy.
(4) Peace is a normal relation among states, and aggression is the exception — direct and unambiguous.
(5) We should enter every military conflict as a moral crusade requiring the unconditional surrender of the enemy.
(6) A free and peace-loving nation has nothing to fear in a world where right and justice inevitably prevail.
(7) Americans live far behind the lines, protected from attack by time, space and a host of allies.
(8) We will have time to mobilize our superior economic resources after a war begins.
(9) Our advanced weapons and continental defense systems established at a tremendous cost and effort will protect us.
(10) Victory ultimately goes to the nation with the highest national income, gross national product and standard of living.

All of these concepts will be altered or questioned in but a few years. It is unthinkable that we approach the years of the gap with the same sense of normalcy, the same slogans and economies, the same assumptions, tactics and diplomatic strategy.

Although other peoples have learned to live for years exposed to enemy attack, I realize that it is hard for us to accept the reality of our danger—particularly when we have been told each year that our defenses were daily stronger and superior to any other. I realize that we are reluctant to re-examine policies arduously reached, or to believe that these problems cannot be postponed. *But it is precisely this substitution of our preferences for our responsibilities that has led us to the brink of the gap.* Our missile lag is not the cause of the gap—it is but another symptom of our national complacency, our willingness to confuse the facts as they were with what we hoped they would be, to appeal at the same time to those who wanted a quick solution and those who wanted a less burdensome one. The people have been misled; the Congress has been misled, and some say with good reason that on occasion the President himself has been misinformed and thus misled. For we have been passing through a period aptly described by Stanley Baldwin, in disclosing Britain's unpreparedness to the House of Commons in 1936, as "the years the locusts have eaten."

The Exaggeration of Economy

Perhaps the most serious result of this complacency — and the one we must first reverse — was our willingness to place fiscal security ahead of national security. We tailored our strategy and military requirements to fit our budget—instead of fitting our budget to our military requirements and strategy.

It has always seemed . . . that to emphasize budgetary limitations without regard to our military position was to avoid an inconvenient effort by inviting the disaster that would destroy all budgets and conveniences. Surely our nation's security overrides budgetary considerations—the Presi-

dent himself indicated this was true in time of war. *Then why can we not realize that the coming years of the gap present us with a peril more deadly than any wartime danger we have ever known?* And most important of all—and most tragically ironic—our nation *could have afforded,* and can afford now, the steps necessary to close the missile gap.

But our task now is not to fix the blame for the past but to fix a course for the future.

New Military Steps

Our attention is logically and necessarily directed first at the *short-range military steps* necessary to keep the deterrent ratio from shifting still further to the Red side and to lessen their advantage, if possible. Here other Senators have distinguished themselves in thoughtful addresses or Committee action.

More air tankers to refuel our SAC bombers and more air-to-ground missiles to lessen the need for their deep penetration of Soviet territory are among the first steps to be taken while we expedite our longer-range ICBM and IRBM developments and our progress on atomic submarines, solid fuels, the Polaris and the Minute-Man. Our continental defense system, as already mentioned, must be redesigned for the detection and interception of missile attacks as well as planes.

It should be obvious from our Lebanon experience that we lack the sea and air lift necessary to intervene in a limited war with the speed, discrimination and versatility which may well be needed to keep it limited—and without weakening our ultimate retaliatory power. It is shocking to realize that units entering the Lebanon "pipeline" at the time of the Iraqi revolt emerged at the other end to find that by then the dust had settled and we had already recognized the new regime.

We need to reduce what General Gavin describes as a "critical cut" in our military manpower begun in 1954. . . . I offered an amendment in 1954 to block those cuts — but as General Gavin now points out: "Congress was assured that our combat strength was not being reduced. We were simply cutting the fat . . . That the contrary was the case few outside the Department of the Army seemed willing to admit."

Finally, if we do not take care, we will create a second gap—between the date when our present ready weapons are obsolescent and the date when our ballistic missiles are operational in any sufficient quantity. To prevent this short-term gap, and to make certain that we have ended the missile lag by 1964, may well require a complete re-examination of our traditional systems of evaluating, budgeting, researching, assigning, developing and procuring weapons.

New Strategic Policies

But discussions of new armaments are not enough—and too late to halt the gap. The gap will begin in 1960. And while stepped-up defense efforts are essential to insure its close in 1964 and thereafter, and to lessen its impact in between, *the years of the gap demand something more than a purely military answer.* Maginot-line reliance upon the military answer of massive retaliation has frustrated policy discussions to date, as mentioned—we must now be prepared to demonstrate that we have other courses besides military action and no action at all. For absence of power no more dictates an absence of policy than the presence of power. On the contrary, ancient man survived the more powerful beasts about him because his wisdom—his strategy and his policies — overcame his lack of power. We can do the same. We dare not attempt less—nor do we dare rely wholly upon those same policies in effect during the years of our retaliatory lead.

What is the fundamental approach to formulating a strategy from a basically but only temporarily disadvantageous position? It is *first,* of necessity, to work for a real peace—for *a reduction of armaments, a reduction of tensions and a reduction of areas of dispute.* The goal of universal disarmament—at least in the area of nuclear weapons—takes on an urgency not heretofore demonstrated by American negotiators who felt they held most of the trump cards. We must redouble our efforts in that regard—and the work of the Senate Disarmament Subcommittee, headed by the distinguished Junior Senator from Minnesota (Mr. Humphrey), has made a major contribution in illuminating areas where our efforts might be redoubled.

But that failing—as well it might, once the Soviets are in the driver's seat, though we must never stop trying—the question again arises as to what basic strategy we will employ during the years of the gap.

The best and most recent example is that provided by the Soviets themselves during the years of *their* gap—when American might was superior. While we would not imitate the Communists per se, *they demonstrated the classic strategy of the underdog—and soon we will be the "underdog."* It is basically a strategy of making the most of all remaining advantages and making the most of the enemy's weaknesses—and thus to buy the time and opportunity necessary to regain the upper hand. This will require not only strong leadership in Washington but also expert ambassadors in the field—men equal to the best of any other nation, who are skilled in the needed techniques of probe and prudence, and whose judgments and reports are more reliable than some of those which misled us in Indochina—and other difficult areas in years gone by.

Twentieth Century America is not accustomed to this "underdog" strategy—although it was expertly practiced by our founding fathers in time of peace as well as war. And we can practice it now.

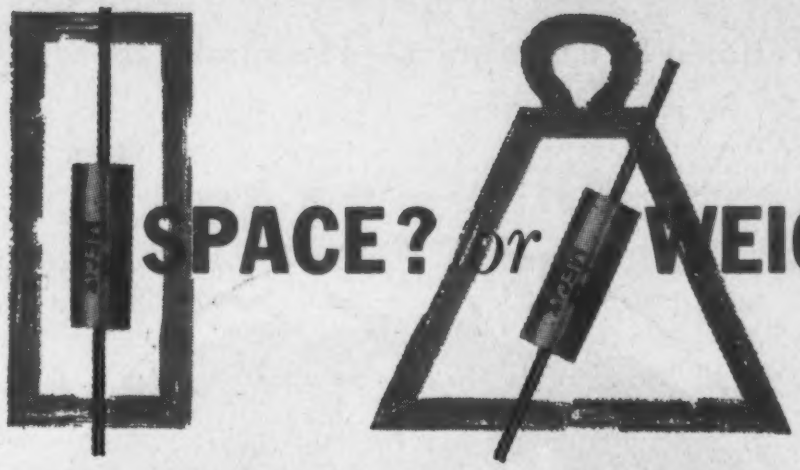
Consider for a moment *the advantages we retain* even after our retaliatory lead is lost:

—We retain *an economic and industrial advantage,* of little use once a bomb is dropped, but of considerable use now in building situations of strength and good will in such key areas as India and Tunisia. There is no need to waste this advantage in a drawn-out recession—and the Congress has an important opportunity to utilize this advantage through action on the Development Loan Fund—the best hope for nations seeking the capital necessary to outstrip their population increases.

—We retain *an ideological advantage,* better equipped than any nation in the world to export the revolutionary ideas of the Declaration of Independence, and thus lead, not frustrate, the nationalist movement against imperialism of any variety. Particularly after our recent excursion in the Middle East, we are regarded in too many parts of the world as an enemy of popular rule—when we had every right to enjoy the cleanest, strongest reputation in this regard of any nation on earth.

—We retain *a geographical advantage,* essential to adequate dispersal and warning systems, and to the encouragement of local resistance to the Red tide. Although, as Mr. Dulles has said, we cannot make popularity our goal, we must shape our attitudes and procedures in a

(*Continued on page* 22)

concerned about  **SPACE?** *or* **WEIGHT?**

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If you need the precision of a wire wound resistor, but in a space-saving, weight-saving size, IRC's new Type ME Metal Film Precision Resistors are for you.

Not only do they save weight and space but they are equal or superior to wire wound resistors in many respects as noted at right:

1. Higher environmental performance
2. Higher statistical performance on environmental tests
3. Higher ambients, extended lifes, extended moisture and temperature cycling
4. Better RF characteristics
5. Comparable or lower in cost
6. Resistance values are stable—just as stable for a 1% resistor as for a 0.10% resistor—just as stable for low T.C.'s as high T.C.'s.

TEMPERATURE COEFFICIENT—In order to meet the variety of T.C. requirements, precision metal films are offered in eight classifications. You may order T.C.'s as close as those for precision wire wounds . . . or, where it is not critical, T.C.'s up to ±100 PPM are available. Classifications are listed below:

Classification	PPM	Temperature span
T-1	±100	−55°C +165°C
T-2	±50	−55°C +165°C
T-3*	−0 +100	−55°C +165°C
T-4*	+0 −100	−55°C +165°C
T-5	±25	+25°C +105°C
T-6*	+50 −0	−55°C +165°C
T-7*	−50 +0	−55°C +165°C
T-8*	±25	−55°C +165°C

*Special types.

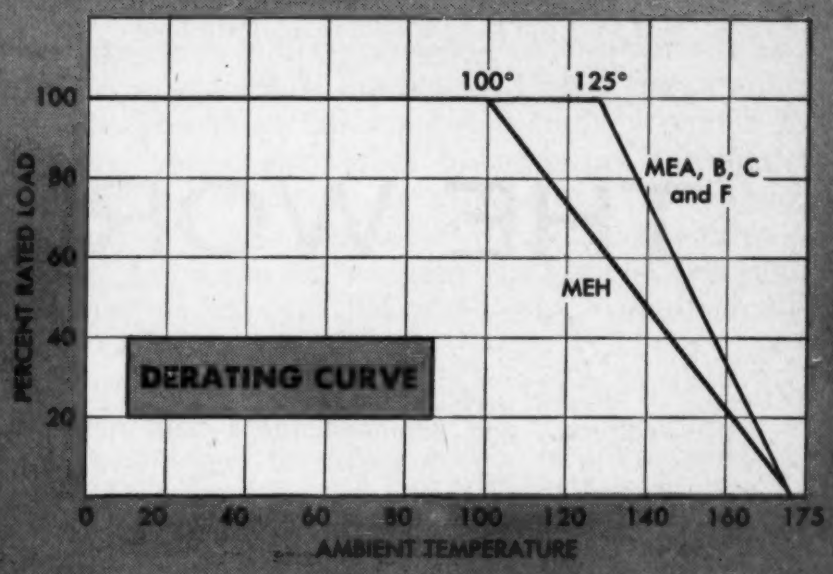
OTHER CONSTRUCTION ADVANTAGES—The new IRC Molded Metal Film Resistors eliminate two other bugaboos of wire wound resistors.

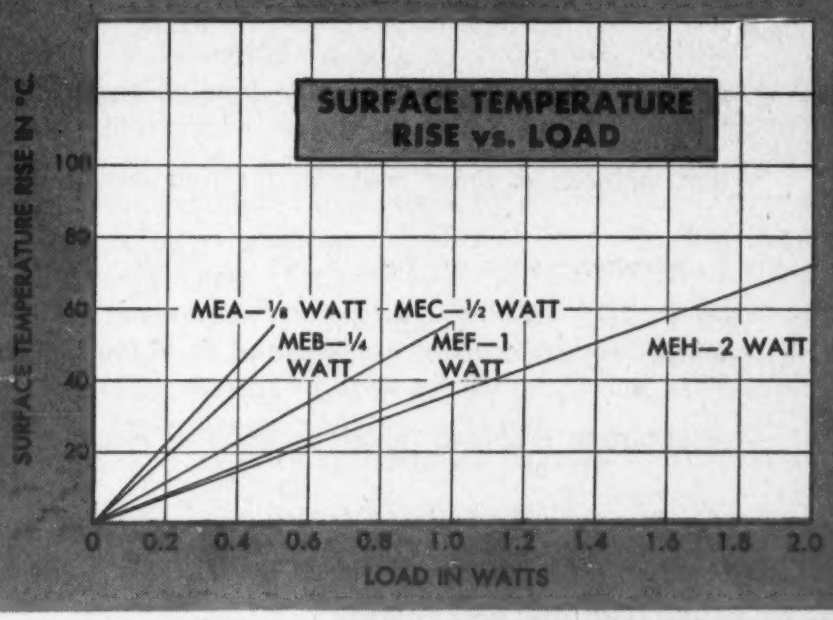
1. No cold joint problem. There is no unsolderable resistance wire in the metal film resistor to be soldered to the terminals. 2. No failure due to excess winding stresses because there are no windings.

IRC Type	5 Wattage Ratings (125°C Ambient)	Maximum Continuous Voltage Rating	New Range Minimum** Ohms	New Range Maximum** Ohms
MEA	⅛	250 V	30	500 K
MEB	¼	300 V	50	1 meg
MEC	½	350 V	50	1.5 meg
MEF	1	500 V	50	4 meg
MEH	2*	750 V	100	10 meg

*100°C Ambient Max. below 500 K ohms.

**NEW EXTENDED RANGES—These new ranges have lower minima and higher maxima by far than our former corresponding values.





Write for New Catalog Data Bulletin

INTERNATIONAL RESISTANCE COMPANY • Dept. 803 • 401 N. Broad St., Phila. 8, Pa. • *In Canada:* International Resistance Co. Ltd., Toronto, Licensee

THE WORLD

of electronics and communications will make many more advances between now and June 1959. Normal progress stimulated by the unavoidable US-USSR technological competition will have provided new breakthroughs and production methods in these fields by the time the 13th AFCEA Convention opens on June 3, 4, 5, 1959. These advances will be reflected in the exhibits and form the nucleus for the information provided in the program of events scheduled at the Sheraton-Park Hotel in Washington, D. C., Wednesday, Thursday and Friday.

June 3, 4, 5, 1959

Kennedy

(*Continued from page* 20)

way that will not cost us our geographical advantage. We do not retain that advantage simply througn paper alliances with the reactionary, unpopular governments which have no indigenous support; and recent events in the Middle East should also have taught us that, to maintain that geographical advantage, no commitment at all is better than one which we cannot or should not honor, which the local populations did not request, which our allies do not support and which is politically or militarily unfeasible. How well we learned that lesson may soon be tested in the case of Quemoy and Matsu.

As we approach the years of the gap, the U.S.S.R. will also retain weaknesses for us to probe — chief among them being *the Achilles heel of the satellite nations.* The Congress and Administration must reverse those policies, last affirmed by a one-vote margin in June, which hamstring our flexibility in attempting to wean the satellites from the Soviets and to drive new wedges into each new crack in the Iron Curtain. There is no point now in consolidating the Red Bloc with our talk of massive retaliation—now we must seek ways of dividing it.

In short, to sound the alarm is not to panic—it is not to sell America short. It gives the enemy no encouragement they did not already possess. But the sound of the alarm does warn us that time is running out—that no matter how complex the problems, how discouraging the prospects, or how unpopular the decisions, these facts must be faced. Hysteria will not help—but neither will complacency. Sustained and informed constructive effort will help—not to provide all the answers for the future, but to help assure us that there will be a future.

No Pearl Harbor, no Dunkirk, no Calais is sufficient to end us permanently if we but find the will and the way.

In the words of Sir Winston Churchill:

"Come then—let us to the task, to the battle and the toil—each to our part, each to our station . . . Let us go forward together in all parts of the (land). There is not a week, nor a day, nor an hour to be lost."

Inspection of Varian Associates by The Honorable Wilber M. Brucker, Secretary of the Army. (L to R) President, H. Myrl Stearns, Russell H. Varian, Mr. Brucker and Sigurd Varian.

THE UNITED STATES ELECTRONICS INDUSTRY'S CONTRIBUTION TO NATIONAL DEFENSE

by
Maj. Gen. Frank E. Stoner
USA, (Ret.)
Assistant to
President
Varian Associates

SINCE completing thirty-seven years' service with the Armed Forces of the United States and the United Nations, I have been working for the past four years in a position favorable for observing the United States electronics industry and its people. I am now firmly convinced that *all* the unsung heroes have not come from the battlefields.

While there is no single source today for business and electronic statistics, nor is there uniform reporting by a host of varied private financial and governmental fact-searching groups, the result has been the dissemination which can at best be classified as estimates. Such an estimate gives the United States 4,200 electronic firms which employ over 600,000 persons including 90,000 engineers and scientists, and which had sales amounting to over $6,500,000,000 in 1957.

The industry is lumped into several unrelated industrial categories, and is not afforded a two-digit standard industrial classification by the Bureau of Census. It has infiltrated into all of the major industries and is now a prime builder or sub-contractor in almost every major military system. The electronics industry is the fastest growing industry in the nation, approaching such giants as steel, automotive and petroleum in value of products. And nowhere is electronics growing faster than on the West Coast.

From the Varian brothers' invention of the klystron together with other microwave tubes which made an outstanding contribution to the development of radar during World War II to Stanford Research Institute's new communications system, based on reflections from meteor-ionization trails, the industry has been the creative core of our nation's military defensive and offensive weapons systems.

Representative of this great industry in every respect is Varian Associates, of Palo Alto, California, headed by Dr. Russell H. Varian, Mr. Sigurd F. Varian and its President, Mr. H. Myrl Stearns. Varian Associates, founded in 1948, is a typical western electronics firm heavily involved in the missile field and devoting a substantial portion of its growth funds to research and development of military weapons. Approximately sixty-five per cent of its total business is United States military.

The growth of this vigorous company typifies the dynamic, young electronics industry—an industry whose growth and vigor are, in a large part, due to engineer-managers such as the founders and management of this firm. At present the company has 1,207 skilled employees among which are 185 engineers, including 25 with Ph.D.'s.

The Klystron Story

The story of the klystron tube is a Varian story from the beginning. Russell and Sigurd Varian came to Palo Alto as small children. Rus graduated from Stanford with a major in Physics and did graduate work; then majoring in the same subject, Sigurd went to California State Polytechnic College in San Luis Obispo.

After college, Russell Varian engaged himself in research work in television and other fields of electronics. Sigurd, on the other hand, became an airline pilot. Sig had many rough experiences flying 1930 airplanes under pioneering conditions in Mexico and Central America. In fact, he had so many close calls in clouds and fog that he conceived the possibility of a radio device which would enable pilots to navigate and, particularly, to land even under conditions of zero visibility. What he needed was what later became known as radar.

(*Continued on page* 38)

RCA TRANSISTORS

RCA GERMANIUM ALLOY-JUNCTION TRANSISTORS FOR COMPUTER APPLICATIONS

Type	Typical Alpha-Cutoff Frequency-Mc	Typical DC-Current Transfer Ratio Value at Collector Ma.	Maximum Collector Ma.
n-p-n Types for Medium-Current Switching Applications			
2N356*	3	30 at +100	+500
2N585*	5	40 at +20	+200
n-p-n Types for High-Current Switching Applications			
2N357*	6	30 at +200	+500
2N358*	9	30 at +300	+500
p-n-p Types for Medium-Current Switching Applications			
2N581*	8	30 at −20	−100
2N404*	12	40 at −20	−100
2N582*	18	60 at −20	−100
2N583	8	30 at −20	−100
2N269	12	40 at −20	−100
2N584	18	60 at −20	−100
p-n-p Types for High-Current Switching Applications			
2N578*	5	15 at −400	−400
2N579*	8	30 at −400	−400
2N580*	15	45 at −400	−400
p-n-p-Type for High-Voltage (−105 Volts) Switching Applications			
2N398*	0.7	60 at −5	−100

*Jetec TO-9 Case

...a comprehensive line offering superior performance in computer designs

RCA's line now includes 14 types specifically designed to meet the demand from computer manufacturers for electrically *uniform and reliable* transistors. Your RCA Field Representative or your authorized RCA Semiconductor Products Distributor will be glad to discuss with you the many advances being made by RCA in this area of electronics. Specify *RCA* transistors for *your* computer designs. For technical data on specific types, write RCA Commercial Engineering, Section J-60-NN Somerville, N. J.

RADIO CORPORATION OF AMERICA
Semiconductor and Materials Division
Somerville, N. J.

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EAST CENTRAL: 714 New Center Bldg.
Detroit 2, Mich.
TRinity 5-5600

CENTRAL: Suite 1154, Merchandise Mart Plaza
Chicago 54, Ill.
WHitehall 4-2900

WEST: 6355 E. Washington Blvd.
Los Angeles 22, Calif.
RAymond 3-8361

GOV'T: 224 N. Wilkinson Street
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BAldwin 6-2366

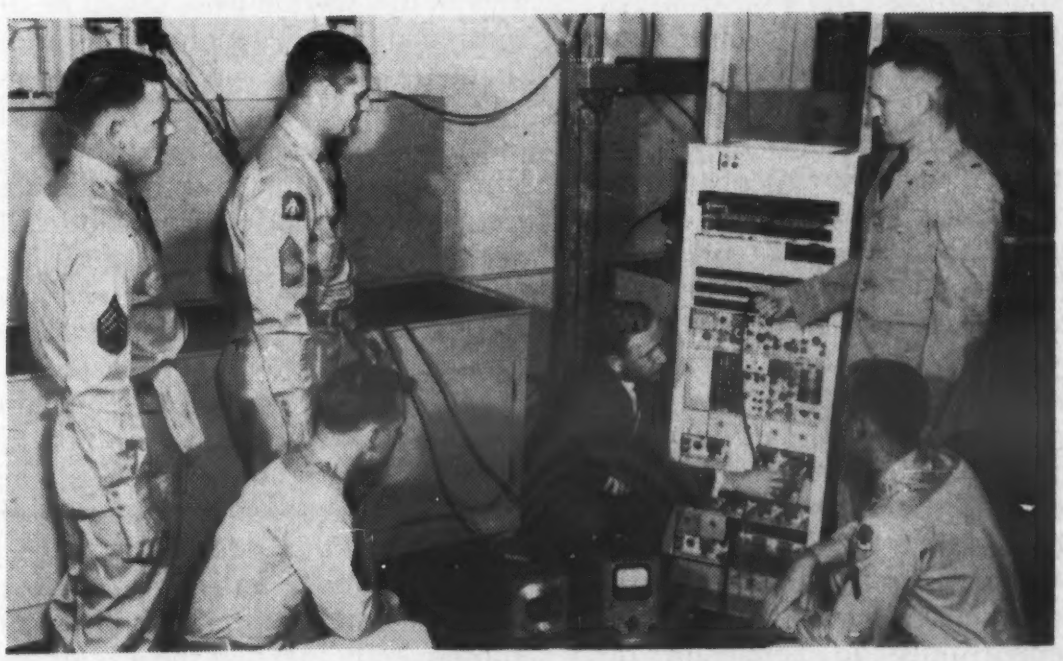
1625 "K" Street, N. W.
Washington, D. C.
District 7-1260

(Left) Clare E. Williams, President of the company, and Major General Ralph W. Zwicker display the Defense Reserve Award Certificate and pennant. (L to R) Milo J. Warner, Civilian Aide for Ohio to Secretary of the Army; Major General Leo M. Kreber, Adjutant General of Ohio; Everett H. Krueger, Jr., Chairman of the Public Utilities Commission of Ohio; Mr. Williams; Robert H. Jamison, Civilian Aide-at-large to Secretary of the Army; General Zwicker, and Colonel Theodore Kimpton, both of the 20th USA Corps (Reserve). (Below) F. W. Hamper, operating VP, explains use of carrier unit in microwave transmission. Use of oscillator and decibel meter for lining up a carrier channel is explained by V. L. Brady (kneeling left of equipment).

INDUSTRY SUPPORTS DEFENSE

a tribute to general telephone of ohio

Editor's note: Many industrial organizations will be interested to learn how a privately owned US company actually became a leader in the military Reserve Program without government direction or control. The voluntary promotion and support of a highly developed military program in communications and electronics by an independent company in our American system of free enterprise is indeed unique. The following story relates a trail-blazing incident which, if adopted by other industrial organizations, will strengthen our nation's reserve program and guarantee a well trained civilian military reserve force in being.



SIGNAL STAFF REPORT

As a result of "outstanding co-operation with the Armed Forces Reserve," the General Telephone Company of Ohio has received the distinguished Department of Defense Reserve Award. This is the first independent telephone company in the United States and one of the few industries in the Ohio, Kentucky, West Virginia area to obtain such a distinguished honor.

The award was made, on behalf of Secretary of Defense Neil McElroy, by Major General Ralph W. Zwicker, Commanding General of the 20th United States Army Corps (Reserve), Fort Hayes, Columbus, Ohio. Clare E. Williams, President of General Telephone Company, accepted the award for his organization.

The citation, presented during ceremonies held in Marion, Ohio, reads: "The General Telephone Company of Ohio . . . is cited for outstanding co-operation with the reserve program of the Armed Forces. By its personnel policies of hiring, promoting and transferring reservists without discrimination and granting military leave in addition to regular vacation periods with compensation for any differential during tours of reserve training, its employees have been encouraged to participate in reserve activities.

"Further, by making available schools, equipment, texts, transportation, instruction and quarters for training to reserve units, employees have been immeasurably assisted to better fulfill their reserve obligations. The utilization of its house organ . . . to publish pertinent reserve news and information has afforded reserve affairs generous publicity."

The Honorable C. William O'Neill, Governor of Ohio, in his message of praise to General Telephone, said: "I wish . . . to convey my words of commendation for the honor which you brought to Ohio, through your work in the reserve program. Too frequently, I fear, the benefit and the need for accepting reserve opportunities and challenges during peace-time is overlooked.

"I trust that your example may serve to stimulate other companies and, indeed, citizens all over Ohio to more effective effort in this respect."

United States Senator Strom Thurmond of South Carolina, Brigadier General in the Reserves and member of the Armed Services Committee of the Senate, sent the following message which was read at the presentation ceremony: "I would like to take this opportunity to commend the General Telephone Company of Ohio for the wonderful co-operation given the reserve. This is a high mark of patriotism as demonstrated by the decision of the Secretary of Defense to present this important award to your company.

"I have never heard of any particular company which has done as much as your company to aid our reserve program. . . . It is a rare thing—if not unique—for a company to provide the training facilities itself."

Recommendation for the Defense Reserve Award was based in part on the fact that the company provides its resources for use by Company C, 307th Signal Construction Battalion in its reserve training. In 1955, the company initiated a comprehensive training program designed to familiarize its employees with the latest and most modern methods of telephone communication and procedure. Shortly after the program's inauguration, the company offered to make their facilities and technical knowledge available to the reserve group.

Mr. Donald C. Power, President of General Telephone Corporation and a Director of AFCEA, when informed of the Department of Defense Award, modestly remarked: "Our objective is not only to support the economic growth of America through the services of our organization in the communications and electronics field but equally important is our desire to support and contribute,. on a voluntary basis, to the strengthening of the military objectives of our Department of Defense."

This was undertaken after Richard S. Zachman of the company's public relations department was informed by local reserve officers that there was a strong possibility reserve activities in the Marion area would be discontinued. Such action would necessitate travel each week by members of the reserve unit to distant points in either Columbus or Mansfield, Ohio, for military training. The effect of this situation is obvious. To avoid the disintegration of a local unit definite action was required. Here is where General Telephone and Mr. Zachman acted aggressively.

Mr. Zachman stated, "I concluded that there was little possibility that these officers could maintain their 'dwindling' reserve unit here (Marion) unless they started at once to reorganize their entire program, establish better training facilities and subsequently increase the size of their unit. Equally important was the necessity of their gaining favorable public interest and support from the community and from local industry.

"I am pleased that we became involved in their problems and in the reserve program because the results of this activity have been a continued source of great satisfaction not only to the company, but to the reservists, the state and the national defense program. . . . Results began to show immediately. The training program and facilities offered by General Telephone also provided incentives for young men who might be eligible for enlistment in the reserve program. The unit started to grow, the reservists were receiving excellent signal training and in less than six months everyone became enthusiastic and we were all quite proud of this 'civilian' soldier battalion.

"At this point, the Senior Army Advisor for Reserve Affairs in Ohio, along with other military representatives and officers of the company, was invited to an inspection tour of the reserve unit attending sessions at the company's plant training school.

"The Senior Army Advisor, representing the Commanding General of the Ohio Military District, commended the company and the unit on our method of operation and decided that the unit should definitely remain in Marion." (Following his review of the company's activities, Colonel Lewis A. Bonifay, Senior Army Advisor, pointed out that Marion could not have maintained a signal company had not the telephone company stepped in and offered its assistance.)

Mr. Zachman continued, "By making the investment of our plant training facilities and instructors' time supporting the reserve program, we were confident that we would not only be able to provide a well rounded training program for our own employees who were reservists, but also for those reservists in other industries in the area. The coordinated program worked out splendidly. Besides a reawakening interest in reserve training proficiency, a parallel benefit became recognizable. The excellent mental and physical training and the stepped-up military discipline had a very marked effect on the efficiency of the company's (reserve) employees in Marion and outstate."

As proof of General Telephone's leadership, one has only to look at the record. The Marion unit which had an enrollment of only 25 enlisted men and two officers now numbers 100 enlisted men and three officers.

The Marion story represents an investment in Americanism—the dividends strengthen and protect our heritage.

FACE the FACTS

WITH the threat of Communism ever present coupled with our policy to vote billions yearly for national security and domestic administration, our government spending program, huge in the past, has now and will continue to be materially increased.

From a business standpoint, it is still somewhat ironical when one reflects upon the rather awkward and ill-informed approach on the part of average industry for its participation in these tremendous military and other agency requirements of Uncle Sam—by far the world's biggest customer.

As a case in point, 10 years ago an official of one of the giant companies in charge of their Washington U. S. government business office called upon our organization for certain pertinent procedure information—he had previously read an article which we publicized in a major magazine. Following the line of his question, it was most perplexing to observe that a concern of such magnitude employed a key man with such a limited knowledge in a major capacity of this kind. We had occasion to recontact this same company about a year ago upon a rather involved procurement inquiry and found to our greater amazement that this same gentleman was still in charge of their Washington government business. He had added little or no enhancement to his previous knowledge of the complex government business practices or methods of operation.

True, this company is perhaps obtaining X millions of dollars of government business, but how many more times X million could be multiplied if qualified specialists directed their operations!

It is for this purpose that this article is presented—to bring home to industry the realization that the development and supervision of U. S. government procurement is not only a highly specialized field but a professional one not to be treated indifferently. Not only does it entail a study and understanding of the various technical and requirement areas, basic for constructive procedures, but a knowledge of the psychology of the government personnel with which one must work.

Rather recently, our services were solicited resulting in an employment for a specialized type of business with a certain key agency having a very large and lucrative potential. For a period of 6 to 8 months this particular company which had enjoyed a large volume of business in the past, was not obtaining any results whatsoever. In line with their explanation of events they specifically dwelled upon their failure to achieve business due primarily and solely to indiscretions on the part of officials. On the face of it, this appeared to be the issue. However, looking "at the other side of the coin," we made it a point to cultivate the personal acquaintance of the responsible parties in charge. As you have probably guessed, we came up with an entirely different observation from that which our principals possessed. In contrast to their thinking, there was not the slightest indication of anything out of line, but the facts pointed to a lack of understanding of the parties in charge.

The above information was acquired in less than two weeks' time resulting in a complete turnabout of procedure so that this particular company now knows how to go about the procurement of this lucrative business in a truly intelligent and constructive manner.

When industry desires an answer to a problem involving any other phase of its relations with any branch of the U. S. Government except sales of its product to the government, it regularly and unhesitatingly calls upon specialists in those particular fields—its Congressman for political matters, its accountant for tax questions, its attorney for legal interpretations. The same practice, however, does not apply to the sales of a product to the government, though few manufacturers know much about the necessary procedure.

Industry spends unhesitatingly and on a big scale to promote commercial sales, but it allots an almost infinitesimal amount for a constructive participation in the government's vast potential.

The government purchase structure is vast, complex and, therefore, somewhat obscure to the uninitiated.

The first step to master this structure is to prepare a mailing list of the various units throughout all departments, Army, Navy, Air Force, General Services Administration and all others in which your products may be used or purchased. This list will vary from 25 to 1500 or 2500 units, depending upon

(*Continued from page* 31)

by Sol C. Bennett, *Sol C. Bennett & Associates, Inc.*

Government Business Consultants

COMMUNICATIONS
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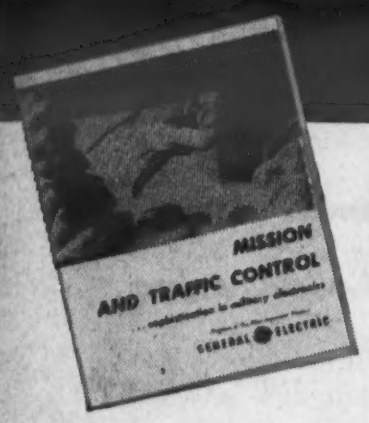
LMEE-M & TC Systems will control the counterpunch!



Tomorrow's airborne weapon systems will be no more effective than their Mission and Traffic Control subsystems. Integrating independent in-flight systems into a coordinated avionic function represents a new and far-reaching sophistication in military electronics. ➢ ➢ The LMEE Department, with the unsurpassed support of General Electric research, can develop and produce all or any part of Mission and Traffic Control subsystems plus their related support equipment. ➢ ➢ For brochure . . . "MISSION AND TRAFFIC CONTROL . . . sophistication in military electronics," write Dept. 8S.

LMEE

GENERAL ELECTRIC

LIGHT MILITARY ELECTRONIC EQUIPMENT DEPARTMENT
FRENCH ROAD, UTICA, NEW YORK

A DEPARTMENT IN THE DEFENSE ELECTRONICS DIVISION

— GOVERNMENT —

TAX RELIEF FOR SMALL BUSINESS The last session of Congress passed a bill designed to give small business firms approximately $260 million annual tax relief. This bill allows, among other things: a fast write-off of 20 per cent of the cost of new and used equipment in the year of purchase with a $10,000 limit; a three-year carryback for businesses with net operation losses, and individuals or partnerships investing in small businesses can count losses up to $25,000 a year as ordinary losses rather than capital losses as in the past.

THOR AND ATLAS USE SAME NOSE CONE With very minor modifications, the nose cone that flies on Thor missiles can also be used by Atlas missiles, thus saving the taxpayer the money for an extra development program. The General Electric Co., Missile and Ordnance Systems Department, developed this blunt nose cone which contains instrumentation to stabilize and to control the cone, or re-entry vehicle as it is sometimes called, during its long ballistic flight after it separates from the air frame.

BOMARC TARGET HIT A Bomarc air defense missile hit its target after being fired remotely from 1500 miles away in an Air Force test in August. For the test a B17 pilotless drone bomber flying some 250 miles out over the Atlantic assumed the role of an enemy attack plane attempting to break through the SAGE system. After the drone was detected by radar at Cape Canaveral, the information was relayed to an eastern air defense control center at Kingston, N. Y. In seconds an electronic computer produced the data needed to guide the Bomarc to its target. Then a button was pressed in Kingston, and the Bomarc was launched (for mission accomplished) from a tactical-type shelter at Cape Canaveral.

ELECTRON TUBES FOR ARMY The estimated procurement of maintenance electron tubes by the Department of the Army for the fiscal year 1959 has been released by the U. S. Army Signal Corps. The procurement forecast is based on the best information available at the time of publication and may be subject to later modification. Prospective suppliers should contact the Commanding Officer, United States Army Signal Supply Agency, 225 South 18th St., Philadelphia 3, Pennsylvania.

CONTRACTS: ARMY: Western Electric Co., coder-decoder equipment in connection with the air defense system, $2,298,000; Collins Radio Co., modification of 7 R4D aircraft for use in testing of air-borne devices, $1,000,000; Raytheon Manufacturing Co., development of pulse code modulation system, $3,092,750; Aircraft Radio Corp., radio direction finder sets, $2,114,651. NAVY: Allen B. Du Mont Labs., Inc., 9 universal missile test systems (AN/DSM-32), $386,000; Ford Instrument Co., a div. of Sperry Rand Corp., production of guided missile computers, $7,400,000; Lockheed Aircraft Corp., 26 P2V-7 Neptune anti-submarine airplanes and equipment, $21,363,922; Westinghouse Electric Corp., production of shipboard radio transmitters and shipboard radar equipment, $22,000,000. AIR FORCE: Bendix Aviation Corp., three year development of air weather reconnaissance system, approximately $30 million on completion; Sylvania Electric Products, Inc., production of all-weather radar navigation system, $3,000,000; Systems Development Corp., air defense systems training program in conjunction with SAGE, $29,776,835.

— INDUSTRY —

EXPANDED FIELD SERVICES TO INDUSTRY Hoffman Laboratories Division, Hoffman Electronics Corp., is now offering its field service facilities to industry on a nation-wide basis. Previously available only to the military, the Hoffman field services include repair, calibration and certification of test equipment and standards, overhaul and repair, field engineering, training and publications on electrical and electronic equipment. Both in-plant and on the job service is offered. All plant facilities are cleared secret and provide resident government inspection.

NATIONAL DISTILLERS LEASE WESTERN UNION SYSTEM A modern, high-speed communications network of more than 7,500 miles of leased, private wires linking 27 cities and 40 plants, offices, warehouses and ordering and shipping points by teletypewriter is speeding deliveries of alcoholic beverages and industrial chemicals to the customers of National Distillers and Chemical Corporation. The system is reported to be the first electronic data processing-communications setup in the alcoholic beverage industry and one of the most advanced and efficient in the chemical industry. It is equipped with Western Union's No. 28 teleprinters and Univac computers by Remington Rand Division of Sperry Rand Corporation.

NEW WEST COAST OPERATION The Special Products Division of the Sprague Electric Company has opened a west coast branch at the new Sprague plant in Visalia, Calif. This Pacific Coast department will be responsible for the design and production of magnetic components and various types of computer packaged circuitry. Mr. Robert P. Sheehan, formerly of the Sprague Special Products headquarters staff, will serve as chief engineer of the Visalia department, which will be completely independent of the parent North Adams, Mass., magnetics group insofar as engineering and production are concerned.

— GENERAL —

DEW LINE EXTENDED The Danish Ministry for Greenland has announced that the DEW Line will be extended to stretch across Greenland. Negotiations to extend the DEW Line, now rimming northern Canada and extending into Alaska, have been under way between the United States and Denmark for almost a year.

TAILFINGEN, GERMANY, "HOPPED UP COMMUNICATIONS" Financial disaster stared local farmers in the face recently, following a violent windstorm that demolished most of the village's principal crop, hops. A prime ingredient in beer-making, hops are grown on intricate networks of cables supported by 25-foot poles. Unable to get the nearly-ripe hops back in place before harvest time, the farmers turned to the Army communicators for assistance. Working along with the German farmers, Seventh Army troops from the 25th Signal Battalion stationed in nearby Boeblingen pitched in with their equipment and had the crops off the ground and back in shape in less than a week.

SOMETHING NEW IN GIVING A simple plan which eliminates Christmas shopping and provides the right gift for every person has been suggested by "SELECT-A-GIFT." To use this unique plan the donor fixes the price of the gift (they vary from $2 to $150). The recipient selects the gift from an attractive card on which 24 items are shown in color and fully described. Further information may be obtained by writing to SELECT-A-GIFT, Box 2070, Birmingham 11, Alabama.

THREE ASSOCIATIONS HOLD ANNUAL CONVENTIONS ● Major General Herman Feldman has announced that THE QUARTERMASTER ASSOCIATION is having its convention October 9-10, at the Benjamin Franklin Hotel, Philadelphia, Pa. Meetings, panel discussions and seminars of the highest order have been scheduled and General Maxwell D. Taylor will be the banquet speaker. ● Lt General Walter L. Weible of THE ASSOCIATION OF THE U. S. ARMY has announced that their annual meeting will be held October 20-22, at the Sheraton-Park Hotel, Washington, D. C. Colonel Bob Cocklin, Director of Public Relations, reports that Prince Wan, the Foreign Minister of Thailand, will speak on SEATO in the defense of the Free World. Top government, military and industrial leaders will give presentations which are expressed in the meeting theme "The United States Army, Ready for Action—Any Kind, Any Time, Any Place." Exhibits of some of the Army's latest items of equipment and materiel will be on display. ● Colonel Frank Crary has announced that THE NATIONAL DEFENSE TRANSPORTATION ASSOCIATION is having its 13th Annual Convention and Logistics Forum at the Sheraton-Jefferson Hotel in St. Louis, Mo., November 9-12. Outstanding officials from government and industry will participate in presenting the convention's theme, "Transportation Protects the Nation." NDTA's program is top flight. Both the AUSA and NDTA have arranged for Reserve Officers to obtain point credits for attending their meetings.

CALENDAR OF EVENTS:

OCT. 6-7: National Symposium on Extended Range and Space Communications, Lisner Auditorium, Washington, D. C., is being co-sponsored by the IRE Professional Groups on Communications Systems and on Antennas and Propagation and The George Washington University.

OCT. 20-21: The Fourth National Aero-Com Symposium is to be held at the Hotel Utica, Utica, N. Y., under the sponsorship of the IRE Professional Group on Communications Systems.

Face the Facts

(*Continued from page 27*)

the ultimate use of the commodities or materials involved. Making such a list requires endless study, infinite patience and a growing familiarity with the needs of every unit that might purchase or use your product. The names on this list should be periodically circularized by form letter or by advertising data, or by both. It is essential, of course, that all such circular matter be prepared in accordance with the specific purpose desired—and that it be prepared by a fully qualified person.

After this list has been made and circularized, it is necessary to watch the different sources of information about current and approaching government requirements. Such information comes in part from certain periodicals and publications—and even more from personal acquaintance with the over-all purchase requirements of each department of the government.

A manufacturer can take the initiative himself if the specifications of his products apply to government requirements and if he is successful in introducing and establishing them with individual departments. But this again requires an understanding of department needs and a familiarity of the procedure for the presentation of such matters to interested parties. To do this, you should primarily contact such branches of the Services as laboratories or experimental units, or research and development sections of the respective agencies.

If you receive an inquiry that you may be in a position to quote upon, you should be careful to prepare properly the bid forms. The essential factors are: First, acquire a definite and complete understanding of the type of products or materials called for as denoted by the specifications, which is generally indicated by a reference number or description. The specifications are always readily available. If you don't know how to obtain them, call or write the bidding unit and ask the official or officer in charge of this particular purchase for the specifications.

Analyze these specifications carefully and ascertain whether your products or materials can be produced or manufactured in accordance with them. If they can, you are then in a position to bid intelligently and practically.

The style of packing is generally described by a specification reference, so that this information makes it possible for you to determine whether you can meet those requirements. Large packaging or container companies are generally familiar with same. Don't forget to take into consideration delivery or transportation costs from your plant to the destination point.

With all these items in mind you are in a position to calculate your final costs for your quotations. In the preparation of the bid proper, be sure that your prices are inserted in their correct columns; that discounts, if any, are indicated; that bids are properly signed and witnessed if required; that all required copies are similarly prepared. If you cannot fully comply with the government's requirements as to the product, packing or delivery time desired, that fact should be clearly and correctly stated on your bid forms or in an accompanying letter. If you have to do this, it places your bid in a category described as a qualified bid, which means you are supplying the commodity or material with exceptions or reservations. Though such a bid will receive consideration, according to established procedure the awards must generally be made to the lowest unqualified bid, for it has no conditions or reservations.

You should be careful in the preparation of your mailing envelope, inserting correctly the unit and address with the invitation number and opening date. The envelope must be mailed in sufficient time for its receipt by the purchasing unit, though the Comptroller General has ruled that if a bid arrives late, it must be accorded consideration providing it was mailed in sufficient time and no award has been made in the interim by the buying agency.

Timing

A rather frequent but significant error indulged in by companies, particularly those not having Washington offices, appertains to *Timing*.

Certain pertinent matters arise necessitating clarification by the government before further procedure and this, of course, can best be attended to through personal conferences with officials in charge of technical or requirement areas.

Though meetings are prearranged with the respective officials, it is not an unusual occurrence for urgent or priority matters to intervene in the interim, making it unwise to go through with the scheduled appointments at a particular time. However, in those instances where company officials came to Washington for interviews on a particular program the conferences are held irrespective. True, the objectives are perhaps accomplished, but how much more would have been achieved if the appointments were deferred until a more appropriate time when the officials thinking and time could have been devoted wholeheartedly to the subject!

It has always been our practice to first pave the way through a prior telephone call an hour or so before such specific appointments and then go through or defer same in accordance with the wishes of the parties involved. To summarize the gist of this important factor, timing for the approach and presentation is most essential and particularly important for the conduct of successful government business procurements.

Cases in Point

During the past years there have been many amazing incidents in this field—some interesting, many bordering upon the hazardous and ridiculous in view of potential financial losses due either to a presumption of knowledge or to an utter disregard for procedure. Here are some striking cases that actually happened.

• Smith & Co. was informed of an approaching bid for 120,000 units of an item of their production. Being advised of their definite interest in the inquiry, the counselor visited their plant and offices for a careful and diligent review of the entire bid. Emphasis was placed upon a thorough understanding of all details, preparation of bid, and particularly the accurate interpretation of specifications applicable to the manufacture of the commodity itself. Furthermore, and primarily, if any questions arose, the company was not to act upon its own initiative but to call either their advisor or a government official familiar with the intricacies of the inquiry for necessary and correct interpretations. On that occasion, the counselor was assured that there was nothing complex about the manufacture of the commodity and nothing difficult about the bid. Before the inquiry opening, he again called the attention of Smith & Co. officials to production difficulties being experienced by the largest manufacturer in the industry, a competitor bidder.

The invitation was opened and Smith & Co. was low in accordance with existing specifications and, therefore, entitled to the award. But within four or five days after this word was passed to the president of the company, he called long distance and said: "Please void our bid immediately. We have just found out that we made a mistake—the essential raw material ingredient is entirely different from what we thought and will cost us considerably more than we figured. In fact, the company stands to lose $25,000 on the contract if awarded to us, etc."

It was later discovered that the Smith & Co. production men were in doubt about this but failed to get the necessary information by making a $1.50 long-distance telephone call to Washington in this matter of a $100,000 bid.

This incident illustrates the importance of taking advice from those with experience. You cannot bluff your way in this specialized field. Knowledge can be acquired only through an application of the proper efforts over a period of time.

• A rather pertinent case of knowledge presumption was recently illustrated.

A bid was prepared and submitted on the part of a manufacturer who was new in the government business field. Though a consultant was employed for this particular purpose, his advice was not sought in its preparation. The amount of the contract involved was rather substantial.

(*Continued on page 43*)

AE's CLASS "S" RELAYS are used in the Martin MACE and in countless other applications in the fields of automatic and remote control. Send for Circular 1843.

This traveler's passport was stamped by Automatic Electric

There's over $100,000 worth of technical guided missile—the USAF TM-76 Martin MACE—on its way—45 feet packed with extremely complicated mechanism.

Yet among the launching crew, no fingers were crossed. Over and over again prelaunching tests were made—each with the speed of light. And the check-out equipment, activated by Automatic Electric's Relays and Switches, said all's well.

And, as the mighty traveler rises with gathering speed, other AE components within will help it to arrive on target—over 600 miles away.

Here's just one of the exciting new applications for the precise and utterly dependable equipment we make for our parent company, General Telephone, and most of the 4,400 other "independent" telephone companies.

There are many other cases in a rapidly growing list of industries. Wherever automation is speeding and improving the quality of production—wherever new mechanical and electrical marvels are taking shape—you'll find our components getting first call.

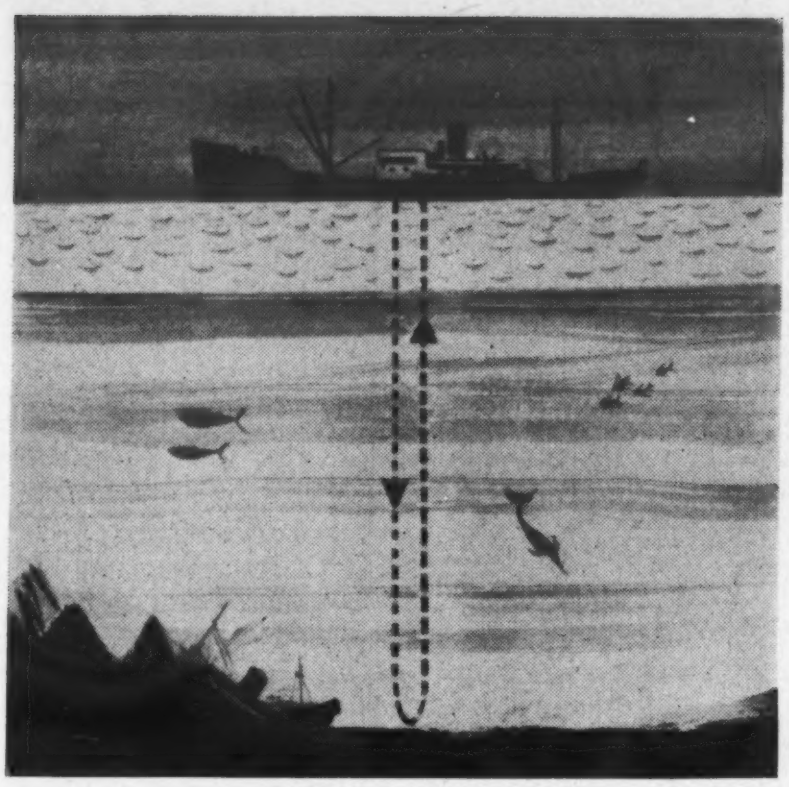
Automatic Electric has rolled out the red carpet for Tomorrow. With a vast new plant holding 35 acres of facilities to double our production. With great new engineering research laboratories, staffed with challenging minds, to extend our horizons.

And, we hope, *yours*.

AUTOMATIC ELECTRIC

Northlake, Illinois

Subsidiary of **GENERAL TELEPHONE**



THE FATHOMETER

by R. P. CURTIS
Commercial Equipment Division
Raytheon Manufacturing Company

★ ★ ★

STARTING in 1901, the Submarine Signal Company had developed and produced a complete coastal navigational system, based on submarine signals, which gained world-wide acceptance and usage. The system involved the transmission of powerful underwater signals from lightships and other fixed coastal stations and the use of hydrophones, or underwater microphones, as receivers on the equipped vessels. With this system the equipped vessels could detect when they were in the area of a coastal station and could determine the direction of the station. The information could be obtained in weather which prevented visual sightings and generally could be accomplished at significantly longer ranges and with greater reliability than air-borne fog signals.

The loss of the *Titanic* in 1912, after it struck an iceberg, stimulated intensive work to see whether submarine signals could be utilized to detect such free floating objects which constituted a real menace to navigation. In 1914 the company conducted experiments on the United States Revenue Cutter *Miami* during International Ice Patrol off the Grand Banks. These experiments proved that powerful sounds produced underwater could generate usable echoes from icebergs as well as echoes from the ocean bottom. (The low frequencies employed in these experiments yielded virtually no directional sense.)

Thus the principal components and principles for echo distance measuring had been worked out as long ago as 1914. However, one major problem remained to be solved before a practical depth sounder could be developed. The velocity of sound in water is approximately 4,800 feet per second so that observation of bottom echoes in the useful range between 1 and 100 fathoms (6 to 600 feet) involves measurement of transit time in the range of 2 to 250 milliseconds. Cathode ray oscilloscopes were not yet available and stop watches could only be used for measurement near the upper limit of the desired range.

The missing link was supplied in the form of an ingenious invention which remains as the principal time measuring device in use for this purpose today. The invention consists of the combination of a disc or arm, motor driven at constant speed, near the rim of which is mounted a gaseous tube, usually containing neon. The neon indicator tube rotates with the disc adjacent to a fixed circular scale which is calibrated directly in depth on the basis of the known velocity of sound and the speed of the disc. As the disc passes the zero mark, a set of contacts is actuated to cause a signal to be transmitted toward the bottom. The returning echo is suitably amplified and causes the neon bulb to flash briefly opposite the appropriate scale position.

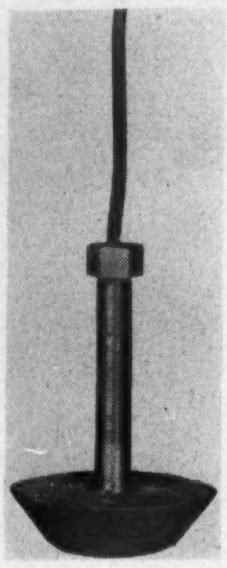
The first Fathometer was installed on the *S. S. Lydonia* of the U. S. Coast and Geodetic Survey in 1924. This equipment was a direct outgrowth of the earlier signaling apparatus. The transmitter or drive was a motor-generator running from the ship's D.C. line and producing an A.C. output of 525 cycles and about 600 volt amperes capacity. This was keyed in the generator output by the indicator contacts and energized an electromagnetic transducer or oscillator to produce a short pulse of underwater sound at 1050 cycles. The receiving transducer or hydrophone was a carbon button microphone mounted in an opening in the ship's hull.

The output of the hydrophone was amplified in a "filter box" which was a 3-stage transformer-coupled amplifier followed by a grid leak detector, all tubes being the new type UV-201A. The plate circuit of the detector actuated a sensitive relay which interrupted the current in a transformer feeding the neon lamp or red light. A second or deep mode of operation was available for depths in excess of 100 fathoms. In this mode, the indicator was slowed down and a fixed white incandescent lamp on the disc was used as the scale reference. Echoes were received directly from the hydrophones into a pair of headphones and the position of the white light could be simultaneously noted since it was only turning at 40 R.P.M. The indicator timing disc was driven by a D.C. motor directly from the ship's line. Accurate speed was obtained by

Editor's note: Fathometer® is the registered trademark of echo depth finding equipment now manufactured by Raytheon and previously by the Submarine Signal Company. It holds a senior position among Raytheon's current products and for a period of 35 years, development of the Fathometer has resulted from many original contributions by Raytheon and its predecessors.

Impact oscillator of early Fathometer equipment.

Transducer of Model DE-122 ↓



manual adjustment of the armature current while monitoring the commutator ripple on a magnetically driven reed type frequency meter.

Significant developments followed fairly rapidly over the years to simplify and improve the major functional elements of the early equipment. The transmitting system was radically altered from a keyed CW oscillator to an electromagnetic impact oscillator. This device consisted of a cylindrical hammer driven against a steel diaphragm by a heavy coil spring. After each transmitting blow the hammer was raised against the spring by a solenoid, with the current in the solenoid being controlled by a series of cam-actuated contacts in the indicator. This impact oscillator was used in conjunction with carbon button microphone receivers for depths of 130 fathoms or less, while deeper operation still required the CW system.

The latter permitted the use of tuned diaphragms in the receiving hydrophones which yielded the advantage of a high mechanical "Q." In another variation on the receiving side, possibly in an effort to get rid of the newfangled electronics, a so-called hydrophonic relay was developed. These relays consisted of a pair of platinum contacts in a water-tight case. One of the contacts was mounted on a diaphragm while the other contact was held on the first by gravity. Bottom echoes from the impact oscillator had sufficient amplitude to momentarily open the contacts and actuate the neon indicator light directly through another relay.

The desirability of some means of continuously and permanently recording the depth information became apparent at an early stage of the development. About 1930, recorders first came into general use. In these units the recording mechanism was coupled mechanically to the timing disc of the associated depth indicator. An arm was made to rotate at uniform speed across a wax-coated recording paper. A small spring-loaded stylus and solenoid were mounted on the arm. The stylus was normally held just clear of the paper by the solenoid. Echoes would cause the solenoid to be de-energized briefly, and the spring-loaded stylus would thereupon scratch away the white wax coating and expose the red paper base. By feeding the paper at a suitable rate the bottom contour could be developed as a succession of such marks normal to the transport of the paper. Subsequent development of electrosensitive paper for facsimile equipment permitted the application of amplified signals directly to the stylus. In this method a thin white coating on the paper is burned away by the electric discharge and exposes a black carbon base. All present Fathometer recorders use this technique.

A significant step toward the modern version of the Fathometer was taken in the mid-thirties with the introduction of magnetostrictive transducers operating at a frequency of about 21 kilocycles. Two of these units were used, each consisting of a stack of thin nickel laminations having windows through which the windings were threaded. The transmission was accomplished by the discharge of a capacitor through the windings of the transmitting unit which resulted in a sharply damped acoustic signal. The discharge was controlled directly by contacts or by specially designed argon discharge tubes. A similar separate transducer of higher impedance was used as the receiver and its output was fed to a tuned amplifier for operation of the rotating neon indicator light. Not the least of the advantages of ultrasonic operation was the elimination of the hammer blows of the impact oscillator which could be annoyingly audible to people in nearby sections of a ship.

Since the end of World War II several changes have been made in our depth sounders, partly as a result of the greatly increased research and development effort sponsored by the Navy in the general field of Sonar. Transducers were changed from magnetostriction to the more sensitive and lower Q crystal types, first Rochelle salt and most recently barium titanate. With these transducers it was found practical to combine the transmitting and receiving functions in a single unit. The driver or transmitter was changed to CW Pulse instead of capacitor discharge for use with the crystal transducers. With simplification and reduced power requirements, 60 cycle vibrator power supplies became the basic source of frequency controlled A.C. for use with synchronous motors in the timing system. All of the recording models were changed from a rotary arm design, which involves some scale distortion, to belt driven stylii arranged to produce depth records in linear rectangular coordinates of depth vs. time.

Interest in depth sounding equipment for small boats and shallower ranges permitted the use of still higher operating frequencies. This change resulted in a substantial reduction in transducer size as well as improved performance from the standpoint of directivity or gain in the transducer pattern. Lower requirements for radiated power and receiving sensitivity permitted further simplification in the electronics to the point where a complete depth sounder, such as our Model DE-122, weighs a total of only 10 pounds and requires less than 15 watts from the ship's supply. By contrast, the earlier systems employing impact oscillators weighed over 500 pounds and required more than 400 watts from the ship's supply. While these two equipments do not perform entirely comparable depth sounding jobs, the comparable modern equipment has been reduced to approximately one-tenth the weight and power required for the old systems.

In the design of echo depth sounding equipment for a desired range of operation there are many factors to be considered. Some are common to any pulsed echo dis-

(*Continued on page* 36)

X-15 AWAY

. . . TARGET: 100 MILES UP! On a day surprisingly soon 45,000 feet above Wendover, Utah, North American's rocket-powered X-15 research plane will be released from a modified B-52 to take man 100 miles into outer space. Throughout the flight trajectory, radio contact between the X-15, the mother ship, chase planes and the ground will be maintained by custom-designed units from a Collins CNI (communication, navigation, identification) system, similar to the electronic packages Collins is providing for the new military jet aircraft.

COLLINS

COLLINS RADIO COMPANY, CEDAR RAPIDS • DALLAS • BURBANK • SEATTLE • MIAMI • WASHINGTON • NEW YORK • COLLINS RADIO COMPANY OF CANADA, LTD., TORONTO • COLLINS RADIO COMPANY OF ENGLAND, LTD., LONDON • COLLINS RADIO INTERNATIONAL, C. A., CARACAS, HONG KONG

tance measuring system, including radar, while others are peculiar to the water medium in which we work. Variations in the topography and composition of the reflecting bottom must also be considered as well as a wide variety of factors associated with the class of vessel on which the equipment is to be used.

The basic parameters of transmitted power, frequency, beam patterns, pulse length, band width, and receiver sensitivity will sound familiar to all who work with radar. However, the propagation velocity must be scaled down by a factor of 200,000 and the frequencies are in kilocycles rather than megacycles or kilomegacycles. It is interesting to note that the combination of these factors results in entirely comparable wavelengths and associated beam-forming problems as between Sonar at 50 W.C. and X-band Radar.

The operating frequency of a depth sounder is generally made as high as practicable in order to minimize the transducer size and installation problems for a given beam pattern. The use of the highest possible frequency has an additional advantage in that the characteristic background noise of both the ship and the ocean falls off rapidly with increasing frequency, the former being generally of considerably greater magnitude than the latter.

The practical upper limit of frequency is determined by consideration of the attenuation loss for the maximum depth range. This attenuation loss, which must be added to the normal square law spreading loss, is approximately proportional to the square of the frequency and can attain prohibitive values. An additional variable for computation of over-all loss is the reflection characteristic of the bottom. This can vary by 20 to 30 db and has a minimum loss over rock or hard sand bottom. Soft bottoms of silt or decayed vegetation are excellent sound absorbers and yield the maximum loss figures which must be accommodated.

Transmitted power in our current depth sounders ranges from a few watts to approximately 100 watts during the pulse. The power required is dependent primarily on the depth range and transmitting response of the transducer, which includes its directivity or gain. The pulse length on shallow ranges is kept short (0.1 millisec.) for good minimum depth discrimination. On the deeper ranges it is generally lengthened roughly in proportion to the depth for two reasons. First, this permits the sound to spread on the bottom so as to produce echoes which are the integrated sum of all bottom elements within the main lobe of the transducer pattern. Second, a long pulse improves the probability of overcoming the statistical variations associated with a long transmission path and complex cancellation patterns in the echoes from an irregular bottom.

The main axis of the transducer beam is fixed to radiate vertically relative to the ship's waterline. While this simplifies the requirements as contrasted with a direction finding system, certain additional precautions are necessary. As previously mentioned, the principal noise background is associated with the ship itself. This noise comes partly from the machinery, including the propellers, and partly from the motion of the ship through the water, particularly in rough seas. Most of these sources lie roughly along the fore and aft axis of the ship, therefore the maximum discrimination, preferably nulls in the pattern, should be obtained in this axis. Since the transducer must be rigidly attached to the hull, which may be a good sound conductor such as steel, necessary precautions must be taken in mounting the active element to minimize pick-up due to structure-borne noise.

At the relatively low frequencies of 20 and 40 K.C. used for the deeper equipment, the beams are kept fairly wide to accommodate pitch and roll of the vessel. For this purpose a rectangular element is normally used with its long axis in the fore and aft line. These transducers have a total beam width of approximately 40° in the thwartship plane and 20° in the fore and aft plane, both taken between the –3db points. Transducers for shallow equipment operate at 200 K.C. and are designed to have a conical beam approximately 6° wide. This narrow beam width permits detailed examination of the bottom as is necessary for survey work and navigation in confined coastal waters. Recent work at this frequency in shallow depths has shown that good echoes can be received from a wide variety of bottoms at incident angles up to 30° or more from the vertical. While some depth error is introduced at large angles, this error is a function of the cosine of the angle and is generally small for roll and pitch under reasonable sea conditions.

Current Depth Sounding Equipment

Our present line of Fathometers is composed of 8 basic models, divided evenly between recording and indicating types. For ocean-going ships and large fishing vessels the Models DE-102 and DE-103 provide visual and recorded indications, respectively up (or preferably down) to 600 fathoms. The operating frequency is at 21K.C. using oil-filled Rochelle salt transducers.

The Models DE-121, DE-116 and DE-701 cover intermediate depth ranges and are designed primarily to meet the needs of a wide variety of commercial fishing vessels and large yachts. These equipments operate at 40K.C. and utilize plastic encapsulated Rochelle salt transducers adapted primarily for mounting on wooden hulls.

The Model DE-122 HOLIDAY was designed specifically for small yachts and fishermen who operate principally in the shallower coastal waters. This equipment is of the visual indicator type with a maximum range of 120 feet and an operating frequency of 200K.C. The active element of the transducer is a barium titanate disc which is housed in a faired casting with an integral hull entrance tube for simplified installation.

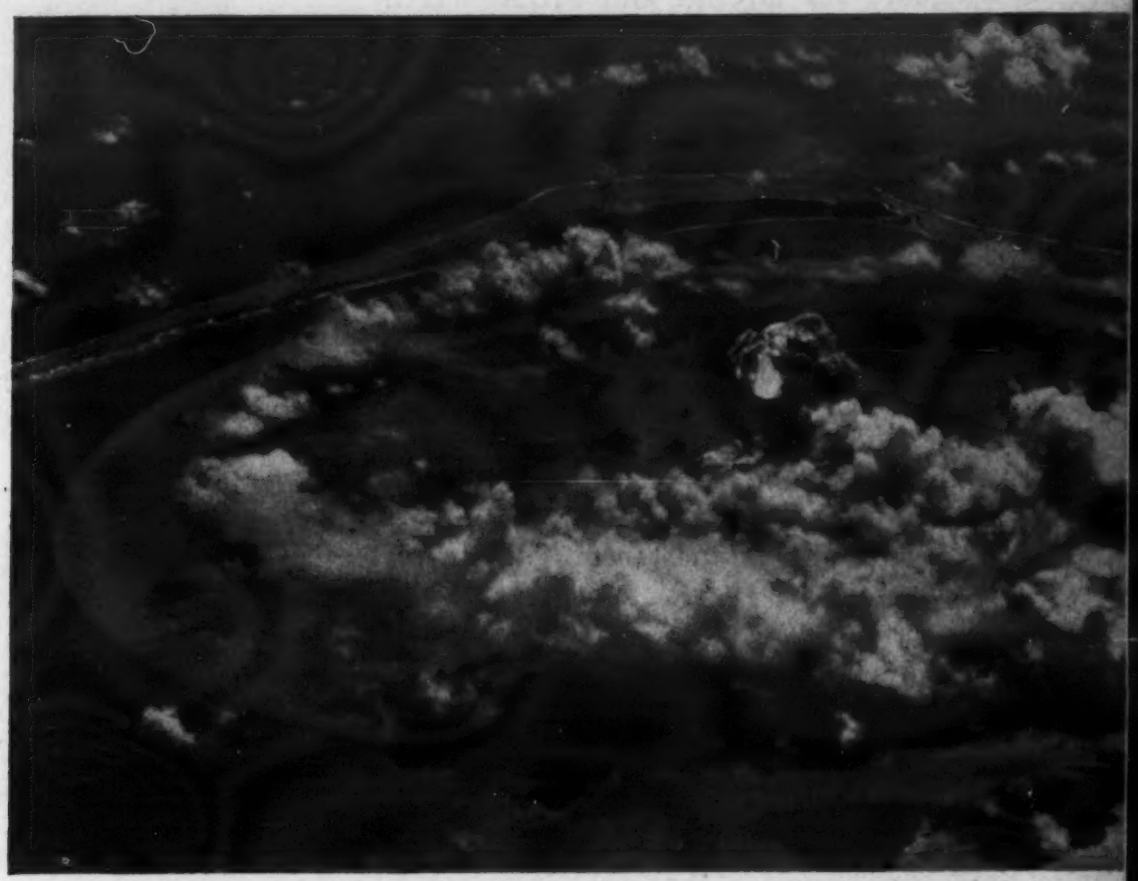
Two special purpose equipments complete the line. The Model DE-111 MARK TWAIN was designed for use primarily by large towboats and other commercial vessels on the inland waterways. The equipment includes a visual indicator with an 80-foot scale, and operates at 40K.C. with Rochelle salt transducers specially adapted for mounting on river barges. The Model DE-119 is a completely self-contained portable depth recorder operating at 200K.C. It has been widely used for detailed survey work from small open boats. The depth scale factor of 10 feet per inch, the portable transducer mounting and its ability to operate from a single 6 volt storage battery make it well adapted to this use.

Future Equipment

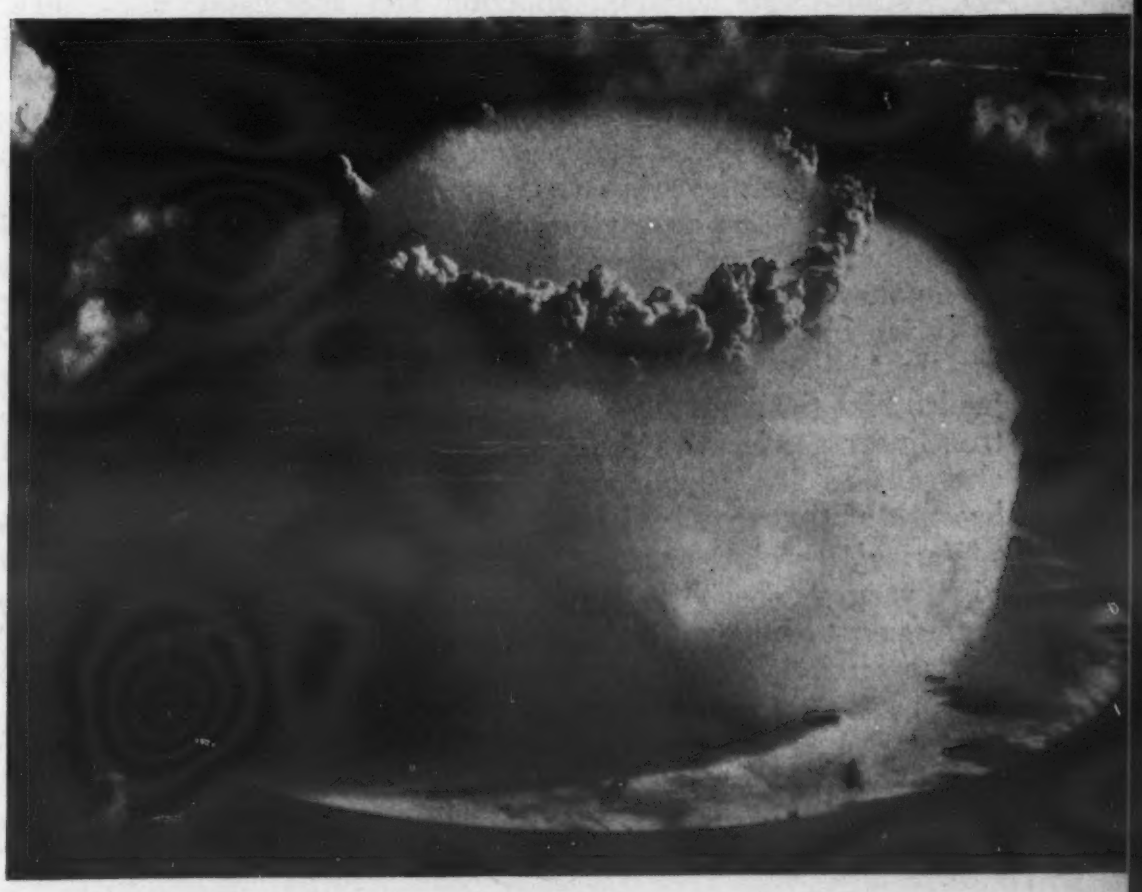
As in all our products, continuing effort is maintained to incorporate new components and techniques where applicable. Printed circuitry is already in use, and work is in process on transistorized versions of the various equipments. Wider use of the newer ceramic materials for transducers is anticipated.

New applications such as fish detection, geographic plotting, and analysis of the composition of the ocean bottom offer opportunities for useful additions to our present line. While the current developments in military Sonar have somewhat limited commercial application, this work is frequently reviewed for further possibilities.

With the advent of the atomic bomb came an undeniable influence in both our personal and professional lives. Since that time our concern and interest with our country's scientific advancements have mounted steadily. As a consequence, knowledgeable publications are in demand. By reading SIGNAL monthly, you become familiar with the forward thinking of distinguished executives, educators, military and industrial leaders of the civilian-military team who work diligently to strengthen our national security for a better America. Further, SIGNAL keeps you abreast of modern trends and the problems of the future in the communications and electronics field.



THE WORLD WE LIVE IN



SIGNAL

communications—electronics—photography

The only trouble with his conception was that no existing device could produce strong radio signals at wavelengths short enough to be useful in radar. Sig and Russel Varian had much correspondence on this subject, and the outcome was that both resigned from their positions and came back to Palo Alto. In the Physics Laboratory at Stanford, they worked unceasingly to invent some device which would produce very short radio waves. In 1938, they were crowned with success when the first klystron operated, and radar became a practical possibility both as a military counter-weapon and a navigation safeguard for aircraft and surface craft.

During World War II, Russell and Sigurd Varian, along with other engineers and physicists who had helped in the klystron development, concentrated on the wartime requirements for research to discover new applications for klystrons in radar, general communications and the expanding microwave field. It is a well-established fact that the use of the Varian klystron played a vital part in stopping the London Blitz and shortening the war by a substantial period. The British had radar, but it was not until they employed the klystron electronic tube that night flying was made possible and was intensified to such an extent that the Allies obtained air superiority and the German Blitz successes were permanently destroyed. It would be difficult to overestimate the great and long-lasting importance of this contribution.

Progressive Growth

In April of 1948, the Varian brothers returned to Palo Alto and with six of their wartime associates pooled their resources of $22,000, as well as their patent rights to the klystron tube, and established the firm of Varian Associates. It has since grown to the largest manufacturer of klystrons in the world by dollar volume. In the beginning physicist Russell and engineer Sigurd Varian had nothing to offer but advanced technology and ideas much needed by our Armed Forces, especially the Air Force. Today, these ideas have become items and weapons vital to our national security.

The growth of Varian Associates can be attributed in substance to the cornerstone policy promulgated by Russell Varian: "In creating, applying and appraising a program of effective management, we must constantly remind ourselves that the foundations of Varian Associates rest upon firm convictions regarding the importance of human values in a scientific and business effort. The ultimate success of Varian Associates depends upon the skill in establishing an environment wherein a high level of productivity can be achieved in an atmosphere of personal satisfaction."

Varian has orders for four linear accelerators including the highest average power electron accelerator ever made. Like the extensively used radioactive sources, electron linear accelerators produce a stream of high-energy electrons but have important advantages over the former because of their confined beam and control features.

Varian's revolutionary VacIon pump, a new tool for high vacuum specialists, was launched last May. Announcement of the pump, an ingenious device invented in our research laboratories, caused a high degree of excitement in the industrial and educational fields. The pump permits obtaining improved cleanliness approaching the absolute, and simplifies the operation of pumping vacuum tubes by eliminating the use of components, such as vapor and cold traps. It is an important tool in giving greater life to tubes and reducing electronic failures.

Now under production there are more than one hundred different types of klystrons with an additional thirty five under development. The company in the past year has greatly broadened its base including klystron parts such as grids and flanges, accessories such as power supplies and power meters, and electronic sub-systems incorporating klystrons such as pulsers and radar transmitters. Several travelling wave tubes and backward wave oscillators are also in production.

Military-Civilian Applications

Military communication applications are of great importance. In addition to furnishing small tubes for this field, we also produce power tubes such as the VA-800C used in the NATO system. Not only do we provide the tubes but also the complete systems such as the high-powered transmitter designed and built for MIT's Lincoln Laboratories. It is being used for investigation of long-distance microwave communications using the tropospheric scatter technique. Many other applications exist —not only for our tubes and systems, but also for our instruments.

In the field of nuclear magnetic resonance, the Varian product line has been greatly broadened since we made the first F-6 fluxmeter. We make two types of NMR spectrometers—high resolution and variable frequency. These are providing very useful service in many areas of chemistry and physics.

Measurement of the earth's total magnetic field strength in the upper atmosphere is possible by Varian's rocket proton free precession magnetometer. The United States Air Force presently has three magnetic observatories equipped with Varian proton free precession station magnetometers. These are providing valuable information on the daily variations of the earth's magnetic field and will provide a valuable tool for developing a method of determining the location and strength of the currents responsible for magnetic storms at low altitudes and in the auroral zones, when compared to earth's satellite magnetometer information.

Right now a small group of engineers headed by Dr. Louis Malter continues to revolutionize the whole microwave tube industry. The key to this success is continuing new development and research. Present retention of earnings wisely used by a young management and engineering group in expanding and increasing research and developing new ideas increases the total value of the company at a substantial rate. A visitor who inspects the company, as was the case during Army Secretary Wilber M. Brucker's visit, is impressed by the gigantic problems it has overcome and what the future holds, and the engineers and scientists ready to meet the challenge.

Excellent coordination of our activities with the military staff planners in Washington has been obtained through the good services of Colonel Walter B. Brown, our representative. In addition to his splendid Army service in the Signal Corps he has had extensive experience in top management positions, both in government and in private industry.

In the last few years we have witnessed many changes in the art of war. The Navy has gone from oil to nuclear power, the Air Force to jets and missiles, the Army from manpower to firepower. Will we be ready when the trumpet sounds? The answer, I believe, may be found in the laboratories and on the drawing boards of our scientists and engineers, especially in the electronics family.

THE NAVY'S DEADLY FLYING FISH

It's called TALOS . . . a name to remember.

It's the missile now installed on the Navy's newly-commissioned guided-missile cruiser, the *U.S.S. Galveston.* It's a surface-to-air weapon that can knock invading aircraft out of the skies.

Deadly accuracy

It's part of a weapon system conceived by Applied Physics Laboratory of Johns Hopkins University. Using an air-borne guidance system developed by ITT engineers, TALOS locks on its target...seeks it relentlessly, the way a compass needle seeks North...swiftly overtakes and destroys it.

The deadly accuracy of TALOS makes it one of the most important and successful weapons available for the defense of our skies.

The Army will use it too

So keen, so accurate is its air-borne guidance system, the Army will use TALOS too. The Navy and the Army are pooling their resources—working in close, effective cooperation—to develop land-borne, mobile launching devices and modified firing controls . . . to take the fullest advantage of TALOS' remarkable "brain power" and striking power.

The big job of ITT in missile guidance

TALOS is just one of the missile tasks that have been assigned to ITT. The Army's LACROSSE is another. ITT engineers developed its complete guidance, ground, air, tracking, and computing systems. They contributed to RASCAL, for the Air Force. They developed the launching and firing controls and test equipment for BOMARC, another Air Force missile. ITT engineers developed, designed and supplied much of the vital communication systems providing telephone service and warning information at the ATLAS intercontinental missile bases.

It's a big job—requiring research, experience, skill, imagination in electronics and other fields. It's a job that ITT is proud to be a part of.

ITT

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AND MANUFACTURING PLANTS IN 20 FREE-WORLD COUNTRIES

by Cdr. John N. Johnson, USN, (Ret.)
Manufacturer's Representative

VALUE ENGINEERING

from the sales standpoint

★★★

RIGHT at the start, it might be well to give a general definition of Value Engineering. Expressed in its simplest terms, it is: "Making something better and for less money." However, this merely scratches the surface and when the ramifications of the subject are revealed, it is easy to see that it is an extremely important, in fact essential, activity in the country today.

As far as I have been able to determine, the original thinking started with a man named Larry Miles, a purchasing agent at General Electric. The company began to take a second look at items which they were producing to see if it was not possible to reduce the costs below the figures which they had come to accept as the lower limit. As they progressed along this line, they found numerous ways in which the problem could be attacked. And, under the term Value Analysis, they established quite an elaborate system. The Bureau of Ships in the Navy Department soon heard of these developments. Always alert for possible savings, BuShips asked permission to send some of their men to GE to study their pioneering efforts. BuShips, in turn, conducted seminars to train representatives from their various Yards and installations with the idea of setting up Value Engineering Departments.

One thing that impressed me and made me realize the importance of Value Engineering came when I tried to find the V.E. section in the Defense Telephone Directory. I finally gave up and found the number through Information. When I arrived at the Value Engineering Section for my first appointment, I asked the secretary to show me where they were listed in the Directory. Admiral Mumma as Head of the Bureau of Ships is, of course, the first name listed. About six lines below is the Director of Value Engineering, Captain J. M. Reigart. Really, a top-side operation.

My introduction to Value Engineering came at the recent AFCEA Convention at the Sheraton-Park Hotel in Washington, D. C. The speaker who particularly interested me at the June 6th technical session was Mr. Albert Sikorsky of the Bureau of Ships, Navy Department. I may have heard the term Value Engineering before, but during Mr. Sikorsky's talk it first really registered on my consciousness, and probably the greatest single contributing factor was an example which he gave to illustrate the work that Value Engineering was doing. In this example, he exhibited a small piece of electronic gear (a band pass filter) which was about 6 inches square and perhaps an inch thick, and he told us that the Navy Department had paid $104.00 apiece for these units. In the course of their Value Engineering studies, BuShips had examined this filter to see why a small item should cost so much money and discovered an interesting piece of information. The specifications provided that this unit must operate on a range of from 50 to 400 cycles. Someone wondered why it was necessary to cover such a wide range. They next checked into the places where these units had been used and found that, of the thousands which had been purchased by the Navy Department, every one was being used on a standard 60-cycle circuit. The next step was fairly obvious to see if a 60-cycle unit could be bought cheaper. They found that it could—for about $2.50—which, of course, meant a tremendous saving on every item purchased. This illustration appealed to me particularly when Mr. Sikorsky went on to explain that the Navy not only was looking at production methods but was giving a very close scrutiny to the specifications involved. In this case, BuShips turned up one of the reasons why Government Services are paying so much for items which they buy: a too rigid adherence to specifications. Entirely too often, once a specification has been written, the man who later uses it considers the specification to be untouchable and to be applied straight across the board, whether it is applicable or not. The original limits of 50 to 400 cycles undoubtedly served a useful purpose when the specification was originally written, but when applied to this particular filter, it may be considered a possible waste of taxpayers' money.

Another point made by Mr. Sikorsky was the arrangement that has been worked out by the Bureau of Ships to encourage manufacturers to reduce the cost of items which they produce. In the old days if a manufacturer came up with a brilliant suggestion to cut costs, he would find that his contract was reduced by the amount of the saving. After a few tries, and having seen several lucrative contracts whittled down through his own helpful suggestions, he would decide that it was better to follow the specifications to the letter and not worry about trying to save money for the government, if he hoped to stay in business. The new approach recognizes this fact and test contracts have been written in which a Value Engineering clause is introduced. After the bidding is completed and a manufacturer has secured the contract on the basis of his bid, he goes ahead and makes the first prototype model, as outlined in the bid, and according to the original specifications.

When this model has been completed, the Navy then authorizes, or in fact demands, that he make a Value Engineering study of that prototype model to see just how the cost could be cut. The Navy is very insistent on the fact that the men who make the Value Engineering study have had nothing to do with the design or fabrication of the original prototype model. As they express it, the man who originally conceived and executed the first design has his "hot blood" in that particular idea, and it is almost impossible for him to look at his own handiwork with an unbiased appraisal and see the real possibilities for cutting costs.

For the above reason, a separate team of value engineers is given the assignment. Perhaps the company itself has such a team. If so, it can be used; if not, a consulting organization can be hired, or the company can hire new men at Navy expense to make the required study. The contract sets forth the study period which runs from one to four months, depending upon the complications of the idea involved. Also, this study includes a destructive look at the specifications involved, with the definite idea of changing them in any fashion that will be acceptable to the Navy and that will produce an item at a lower cost. If the manufacturer through this study of specifications comes up with an actual change in the specification which results in a saving of money, he will receive an additional profit of 10% to 40% of the saving which he has worked out, depending on the quantity and the price. The Navy will receive the balance of the saving. In other words, there is an inducement for the manufacturer to perform this function competently, and there is also an inducement for the Navy to spend the money for such a study. The cost of the study normally will be absorbed from the savings which result.

A Tool for Sales

Now that my mind was saturated with the above conceptions which appealed to my particular type of thinking, it occurred to me that Value Engineering could be made a very important tool for the salesman or sales engineer. If he could work out a logical application of Value Engineering as far as his product was concerned, he would have an almost sure-fire method of approach to either the government or industry, as everyone is faced today with rising costs and the shrinking volume of money available for appropriations.

I am a manufacturers' representative, which is nothing but a glorified way of saying I am a salesman. So, I decided to look at the products of the companies that I was representing to see if there was not a Value Engineering approach that I could use with each of them. I found that every single one had such an advantage hidden away, ready for me to bring out and put to work.

Take first of all the Emmert Manufacturing Company, of Waynesboro, Pa., which makes drafting machines, drawing boards, desks and pedestals for mounting such drafting equipment. This is an old, established company and their machine, while exceptionally good, is not new. The company has never had a strong merchandising and sales force and so, in many quarters, they are still not well known. However, to indicate the value of the machine, the Navy, needing accurate plots of ship and plane positions, during World War II had Emmert make up special boards. For the automotive industry, Emmert has built boards that are 7 feet high and 148 feet long, which are power operated and which can be manned by a crew of draftsmen.

The clue to my Value Enginering approach came when the company received an order for a board which was to be 3 feet high and 27 feet long. I could understand the automotive industry using the tremendous boards which they have bought for oversized drawings of new cars, but the board 3 feet high and 27 feet long puzzled me and I tried to find out why this particular size had been ordered. The board was going to an organization that does electronic work and the first answer I received was that it was to be used for wiring diagrams.

VE Has Other Applications

The carriage of the Emmert Micro-Drafter rides on a horizontal rail which extends the full length of the board. A vertical rail which is attached to the carrier provides for vertical motion of the angle setting quadrant and the two scales. By setting the vertical lock, a 27-foot line can be drawn by sliding the Drafter from one end of the board to the other. To trace one horizontal wire in the complicated maze of a wiring diagram, place the horizontal Drafter scale on this wire and lock vertical movement. Slide to the other end of the board—same wire.

When I thought of the tremendous amount of time that could be wasted by someone trying to follow a wire from one end to another of a 27-foot drawing, I realized that I had my Value Engineering sales point. It is true that this is a slightly different application than the example cited by Mr. Sikorsky because it does not bring about any change in a specific product, but the use of this equipment will certainly bring about a saving in time, during the fabrication of that product, and will contribute to the ultimate saving on the whole job. This, I believe, is a *proper extension* of Value Engineering.

The week following the AFCEA Convention, I attended a day long seminar on Value Engineering which was held at the Roosevelt Hotel in New York City. The panel of speakers was made up of Mr. Jack H. Scheinman, Vice President of Willor Manufacturing Corporation, Mr. Bernard W. Eades, Director of Value Engineering, General Dynamics Corporation, Stromberg-Carlson Division and Mr. Sikorsky, BuShips. During the discussion period, I suggested to Mr. Sikorsky that the concept of Value Engineering was being held in too narrow a range and I felt that the principles could be utilized in a much broader field. He immediately asked what field I had in mind. My reply was "grass cutting." This answer lay dead and cold before the audience, as it was not possible for me to develop my point without using the specific product I had in mind, and the representative of the Industrial Education Institute who was running the seminar, did not wish to allow the use of product names or even product identifications. Having the opportunity now to be more specific, I can clarify the meaning of my answer. In recent weeks I have visited various government installations in the neighborhood of Washington, D. C., such as the Pentagon Building, the Agricultural Research Center at Beltsville, Fort George G. Meade in Maryland and others. In practically every case, I have seen men using tractors of the size and comparative expense of the International Cub and sometimes even full-sized farm tractors to tow a gang of from 3 to 5 lawn mowers. In other words, to do this job they were using a towing medium which costs some $1500.00 for a stripped down model or $2000.00 to $4000.00 for the larger and more elaborately equipped sizes. It happens that I represent the Copar Company in Laurel, Maryland, which makes a tractor called the Panzer. I came to know it because, three years ago, I bought one of their units for my personal use to cut five acres of lawn surrounding my house in Pennsylvania. After three years of experience I know that the tractor is good and that it will stand up under rough usage. The frame is rugged, tubular steel and the tractor is driven by a 9 horsepower Briggs & Stratton motor which any lawn mower mechanic can repair and keep in running order. The price of this tractor is not $1500, but about $500. It is my contention that literally millions of dollars of government money could be saved by using a tractor of this size for grass cutting instead of the more elaborate and expensive models. Value Engineering? Perhaps this may seem like extending the principles too far. However, the money for cutting grass has to come out of government appropriations and if it were not being used for expensive tractors, it could be utilized to buy us more protection.

In this way, I went down through my whole list of products. One firm is a manufacturer of small machine tool accessories, the Rigid Manufacturing Company, Cincinnati, Ohio. Among other products, they make a "quick chucking" device for holding work for milling, drilling, boring or grinding. It is a comparatively simple unit which does not cost much money; yet on a limited production run which is often

encountered in doing prototype work, it can save considerable time and money in getting pieces on and off the machine.

Another company, the Vulcan Machine Company in Waynesboro, Pennsylvania, makes a little device called a Tap Saver. In many plants, dull taps are thrown away because they are too much trouble to sharpen. This little machine, by a series of special adjustments, following the tables which are provided, will quickly and accurately position taps, so that a grinding wheel will put them back in good usable condition. Again, this may be stretching the Value Engineering concept somewhat, but it does contribute a saving to the over-all cost on any job, and I believe it rightfully belongs in this category.

One other product which has an extremely interesting history is the Uniterm Index to Patents, in the fields of chemistry and electronics. The list of users is a regular Who's Who in the chemical industry. With the auspicious start in the chemical field, Information for Industry felt they were justified in bringing out an Index to Electronic Patents. This Electronic Index covers the most recent and important work that has been done in the electronic industry. Since the Index was made up, not from the brief extracts published by the Department of Commerce but from a complete reading of every patent that was issued, and, since each item very often was catalogued under from 20 to 30 headings, it can be seen that the "Uniterm Index to Electronic Patents" is a very wonderful tool for the research or development man who is starting on a new project. In a matter of minutes, he could find the details of every device in his particular field that had been patented during that year. When one considers the enormous sums that are spent by both government and industry in research and development work these days, it seems needless to stress the great value this Index could be from a Value Engineering standpoint.

My last product is so new and so little is known about it that I can give only a rough hint as to its possibilities, which are truly tremendous. It is a gas infra-red heater produced by the Perfection Division of the Hupp Corporation in Cleveland, Ohio. We know that it can heat factories, it can thaw cars full of coal so that they can be dumped into waiting coal barges. It can cook a steak and give it the flavor of a charcoal broil. It can heat outdoor restaurants and sports spectators in open grandstands. As they are doing at the U. S. Post Office in Washington, D. C., it can heat an outdoor loading platform where mail trucks are loaded and unloaded. It can dry paint on an assembly line as it is doing today, far faster than electric infra-red, which it is constantly replacing. It can do all these things and many more which the Hupp Corporation does not have a sufficient engineering staff to develop and perfect at this time. Having hinted at the possibilities in this particular product, it is easy enough for anyone in manufacturing, research or product development to think of various ways in which they could utilize it from a Value Engineering standpoint, with great savings to their company. Perhaps the most universal application and one which was immediately seized upon by a large steel company is for preventing rusting of steel in raw storage. If such a storage building is heated by infra-red, the steel will be kept above the dew point so that rusting will not take place. I believe the implications of this use are sufficiently widespread and so readily understood that they need no further comment.

This list of applications of Value Engineering in the sales field is merely the first and obvious one which can be made to a list of products that I happen to represent. Undoubtedly I have overlooked some all-important uses among my own products which will come to light as time goes on. However, it is my firm belief that the salesman or sales engineer, who will analyze his line from this standpoint, will find that Value Engineering has meant much to him in terms of dollars earned. Also he will realize that Value Engineering is one of the golden words of the Twentieth Century which is of importance to all of us whether we are manufacturers, government agents, or merely the taxpayers who are footing the bills.

Personnel Available

As a service to AFCEA members, SIGNAL will make space available in this column for those members who are interested in employment in the communications, electronics and photography industries. Any member is entitled to three insertions in the magazine on a space available basis, free of charge. Please limit your notice to 5 lines. In replying, employees are asked to address: Box ____, SIGNAL 1624 Eye St., N. W., Washington 6, D. C. Letters will be forwarded to the AFCEA member.

AUDIO-VISUAL INFORMATION SPECIALIST. Reserve Lt. Col. SigC, former Army Pictorial Motion Picture and TV Producer and Far East Public Information Officer will consider offers in audio-visual field in States or overseas. 15 years motion picture and television experience. Box 139.

COMMUNICATIONS AND ELECTRONICS OFFICER, Major SigC, twenty-three years' civilian and military experience in planning, installing, testing, and operating. Principal fields: radio broadcasting, military radio communication, public address systems, and ADPS-FCC licensed. Available August 11, 1958. Box 140.

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LCDR USN (Ret) (Ex-WO)—28 years' experience electronics-communications-installation/maintenance—some design/sales experience—desires association with U. S. firm—Resident England but will return U. S. for short indoctrination period if necessary. Box 143.

Government and Military Positions Available

Government and military agencies are invited to use this column to announce available positions which may be of interest to the readers of SIGNAL. Notices will be published three times if not cancelled before. Applicants apply as indicated in individual notices.

CAA WILL HOLD EXAMINATIONS for Flight Operations and Air-worthiness Inspector and Airways Flight Inspector. Experience in aviation activities and specified number of flying hours required for some positions. Education may be substituted for part of required experience. Positions located in US, US territories and possessions and some foreign countries. Salaries range from $5,985 to $8,330 a year. Applications should be filed with Board of US Civil Service Examiners, Civil Aeronautics Administration, Washington 25, D. C. and must be postmarked not later than Nov. 28, 1958.

U. S. ARMY ELECTRONIC PROVING GROUND
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1 Supervisory Electronic Engineer (General)	GS-855-14
2 Supervisory Electronic Engineers (General)	GS-855-13
1 Electronic Engineer (General)	GS-855-13
1 Electronic Engineer (General)	GS-855-12
1 Management Analyst (Digital Computer Systems)	GS-303-13
1 Supervisory Military Intelligence Analyst	GS-134-11
1 Electronic Technician	GS-1671-9
1 Illustrator	GS-1020-9
1 Management Analyst	GS-303-9
1 Supervisory Tabulating Equipment Operator	GS-359-9

Face the Facts

(*Continued from page* 31)

It was ascertained after the opening that, on the basis of price consideration alone, our client was entitled to the award. However, upon a more detailed examination of the proposal, we were shocked to note that our client had deliberately x'd out a form-printed paragraph of the bid proper covering the very significant factor of specification adherence.

Needless to state, even though everything else was in order, there was absolutely no argument for a discussion and review of this award with the negotiator. But had the company consulted with us, this unfortunate incident would have been avoided; under no circumstances would we have even suggested he waste the postage on the mailing of the bid forms.

• Here is another amusing but also ironical incident which occurred. It is a case where over-efficiency caused frustration to a company official, but to our detriment. One of our clients, whom we have been with for many years in certain special capacities, called upon us for clarification of certain problems relating to their current government business services for their company.

Possessing an intimate, general familiarity with their operations, within a comparatively short time—a month or two—we were able to give them a rather complete and comprehensive picture for their procedure relating to the problems involved. At the same time, we enlightened them on a number of other phases which could best serve them in their future contacts with the government.

Following the conclusion of this particular assignment which was for a specific period of 6 months, we were notified that our services would no longer be required for their particular purposes. The technical engineer, whom I have known for many years, was quite frank in his expressions, the gist of which was as follows: "Mr. Bennett, you have given us so much information that it is somewhat embarrassing—in fact, it is enough to keep us going for the next year or two, etc."

To us, the data acquired was nothing unusual or difficult. While the engineer had a cursory knowledge of the government picture, he had no occasion to be expertly versed for the solution of such problems. (In essence, he admitted his own inability to cope with simple and understandable facts.)

Valuable Cooperation

Fortunately, however, we find organizations participating in the government's requirements in a truly constructive manner.

One of the major departments was experiencing continuous difficulty with a certain essential application vital to the efficiency of its operations. The problem was presented to an active supplier. Being highly technical, special products had to be manufactured from suggested (and finally approved) drawings with varied and special tests conducted for the desired answers. Aside from the time and efforts devoted by key engineers of this supplier company, it spent thousands of dollars to find the answer—and found it, thanks to cooperation of the government and with the government.

Incidents of this kind are somewhat frequent for the major companies who are active suppliers to the government in millions of dollars. They will undertake a specialized development project at a costly expense with no positive assurances of a contract. In relative proportion, though, smaller companies can do likewise, but while they hesitate at a government venture because of the costs and risks, they would unquestionably undertake a similar project if commercial aspects were presented to them.

An interesting experience was presented to us many years ago. One of our clients was requested or, perhaps, instructed by the government to build another factory in an entirely different location. This was due to the importance of producing a certain basic product having extreme military significance and was in line with the customary policy of defense mobilization.

Being in a high tax bracket it was advantageous to charge off the cost of the construction of this new plant as quickly as possible and this therefore entailed the procurement of tax amortization benefits.

The job, though apparently not too difficult at first glance, resolved itself into a number of intricacies. The fortunate part was that the president of this company was thoroughly cognizant of such problems and on a number of occasions not only acquired and presented us with the necessary data, but did not hesitate to present himself here in Washington for key appointments relating to the issues.

Needless to state, the objective was eventually accomplished, but the credit was a dual one—cooperation between the principal and the consultant.

Guidance Essential

There are times when contractors are inadvertently misled by their advisors. A key procurement official told this story.

Jones & Co. was awarded a rather substantial contract on a commodity with deliveries over a rather extended period. The price was definitely firm and the schedule of deliveries specifically indicated. But during the course of its fufillment, the raw materials market took a sudden rise causing increased costs of production. Mr. Jones then informed the procurement official in charge of this particular contract that unless his company obtained a substantial or proportionate increase in their price, it would withhold further deliveries. Mr. Jones thought that his particular product could not be duplicated by any other manufacturer, and that unless the government obtained exactly the same specification product, they could not very reasonably hold his company liable. After a few months the Department found another manufacturer able to produce the finished product in exact accordance with the specification requirements and thus completed the unfilled portion of the Jones contract.

A claim (legal and indisputable) was then presented to Jones & Co. for $12,000, representing the difference between the new price the government had to pay to the substitute contractor and the original price of the commodity. Within a few days the government agency received a personal visit from Mr. Jones, who turned over a certified check of $12,000 as demanded, and said he had been "ill-advised by our attorney representing us on this matter."

Instead of assuming an independent attitude toward the government, Jones & Co. might have secured through a review of the entire matter with the official in charge either a cancellation of the unfilled portion of the contract if the material was not urgently needed, or a price adjustment providing the conditions warranted same.

The error made in the preceding can and is attributed to the lack of foresight on the part of the company in not reassuring themselves of the proper personnel in charge of this important operation. There are qualified consultants available, or perhaps they can be developed if they have the right background. *Do not, though, try to secure such services upon the generally desired basis of a contingency, but only employ such personnel upon a business-like status.* Bear in mind the value of knowledge they are to convey and the tremendous amount of time and services entailed for the functioning of an operation of this nature. Another prime consideration is that you should not be misled by the so-called "know-it-all" individual who claims to have an intimate working relationship with this Congressman, that General or that Admiral, etc. Although this may be true, the right type of consultant can readily make those acquaintances as the occasions so warrant.

Conclusion

In summary, it is my unshakable conviction that industry must realize that the procurement of U. S. Government business is not a casual enterprise. It is an enterprise which warrants the guidance and services of a professional to cope with the vast and complex propensities of the problems involved. *Company executives must therefore resolve to devote profound effort to acquire a constructive understanding and approach toward a greater and more successful participation in the requirements of the World's Largest Customer—The United States Government.*

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Association affairs

Special Chapter Activities

To encourage wider interest in the communications and electronics field, special activities will be undertaken by various chapters during the year.

Chicago will present one-year memberships and special certificates for outstanding performance of duty and accomplishments in the field of communications and Signal activities to Army Reservists.

Augusta-Fort Gordon will award a $100 college scholarship to a local high-school graduate for excellence in electronics.

Fort Monmouth has instituted a program of distributing SIGNAL and other technical magazines to local high schools for the use of science classes and other scientific groups. Tinker-Oklahoma City has also adopted this program.

Rome-Utica is inviting science students and instructors from local high schools and colleges to its meetings.

Decatur is conducting four electronics courses, five nights a week. The chapter has already trained 125 students in these courses.

San Juan is assisting the Department of Education, Commonwealth of Puerto Rico, in setting up a program for training technicians in the communications and electronics field.

New Regional Vice President

Major General Harry Reichelderfer, USA, (Ret.), Assistant Director of the Southwest Research Institute, San Antonio, Texas, has been appointed Regional Vice President for Region D. This region covers New Mexico, Texas, Oklahoma and Arkansas.

General Reichelderfer replaces Stephen H. Simpson who resigned because a recent change of duties precluded his active participation in AFCEA regional affairs.

1958 ROTC Gold Medal Award

James E. Van Horn of the University of Alabama was the winner of the AFCEA's award for the outstanding cadet of the Fort Gordon Signal Corps ROTC Camp—1958. This 1958 ROTC Camp Honor Award was presented in August by Brig. Gen. Albert F. Cassevant, Commandant, The Signal School, Fort Monmouth.

This annual AFCEA award consists of a gold medal, a special citation certificate and a year's membership in the Association which includes a subscription to SIGNAL. During the period of camp training, Mr. Van Horn displayed outstanding leadership qualifications and through his direction and supervision of communications and electronics, he demonstrated superior technical knowledge of all phases of their use. His home address is Route 1, Pinson, Alabama.

CONGRATULATIONS

Two AFCEA Directors and Executive Committee members have been promoted to Brigadier General in the U. S. Army Reserve. The advancement of W. Walter Watts and Joseph E. Heinrich was announced recently.

Brigadier General Watts

General Watts, Executive Vice President in charge of electronics products division of RCA and former National President of AFCEA, joined RCA Victor after wartime service with the Signal Corps. He was awarded the Legion of Merit.

Brigadier General Heinrich

General Heinrich, who formerly served as Deputy President of the Signal Corps Board, is staff supervisor of communications for the Long Lines Department of the American Telephone and Telegraph Company.

AFCEA Group Members

Communications—Electronics—Photography

Listed below are the firms who are group members of the Armed Forces Communications and Electronics Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCEA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

Acme-Danneman Co., Inc.
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Aircraft Radio Corp.
Allied Control Co., Inc.
Allied Radio Corp.
American Cable & Radio Corp.
American Institute of Electrical Engineers
American Machine & Foundry Co.
American Radio Relay League
American Telephone & Telegraph Co.
American Telephone & Telegraph Co., Long Lines Dept.
Ampex Corp.
Amphenol Electronics Corp.
Anaconda Wire & Cable Co.
A. R. F. Products, Inc.
Arnold Engineering Co.
Atlas Film Corp.
Atlas Precision Products Co.
Automatic Electric Co.
Automatic Electric Sales Corp.
Automatic Telephone & Electric Co., Ltd.
Autonetics, Division of North American Aviation, Inc.
Barry Controls, Inc.
Bell & Gossett Co.
Bell Telephone Company of Pa.
Bell Telephone Laboratories, Inc.
Bendix Radio Division, Bendix Aviation Corp.
Bliley Electric Co.
Bomac Laboratories, Inc.
British Thomson-Houston Co., Ltd.
Bruno-New York Industries Corp.
Burroughs Corp.
California Water & Telephone Co.
Cambridge Thermionic Corp.
Capitol Radio Engineering Institute, Inc.
Carolina Telephone & Telegraph Co.
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Chesapeake & Potomac Tel. Co.
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Federal Telecommunication Laboratories
Federal Telecommunication Laboratories—West Coast Branch
Federal Telephone & Radio Co.
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General Communications Co.
General Electric Co.
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Chapter News

Gulf Coast

The July meeting was held on the 22nd at Gus Stevens Restaurant. Chapter Vice President James A. O'Connell of Southern Bell T&T Co. presided.

The program for the evening was a film entitled "Progress Call Dixie," presented by Donald H. Presley of Southern Bell.

Montgomery

The chapter held its regular monthly dinner-meeting on August 7th at the Officers' Club of Gunter Air Force Base.

Lt. Col. Herbert Herman, chapter president, presided at the dinner which was attended by 130 members and guests. Col. Sterling Briggs, Director of Communications and Electronics of the Montgomery SAGE installation, welcomed the group and introduced Major N. W. Pinney who gave a slide and lecture demonstration on the over-all operation of the SAGE installation.

Following this briefing, the group was transported by bus to the SAGE building and given a complete guided tour of the operation.

Among the many distinguished guests of the chapter were Sidney W. Reese, Alabama Chief Engineer for Southern Bell Telephone Company, Birmingham, and Mrs. Reese.

Members of the chapter's board of directors are: Calma S. Weiss, Southern Bell T&T Co.; Col. William H. Lyle, USAF, Maxwell AFB; Major Francis M. Grove, USAF, Maxwell AFB; Marlin J. Harris, Jr., Cent. Ala. Elec. Corp., and J. W. Miller, Jr., Southern Bell T&T Co. Membership committee chairman is John R. Johnson, CAA, Maxwell AFB; program chairman—Russell M. Molpus, Graybar Elec. Co.

North Texas

At a recent meeting the following were installed as officers of the chapter: President—Col. Thomas F. Yates, American Tel. & Tel. Corp.; vice presidents—E. T. Bishop, Ft. Worth General Depot, and Earl Trantham, Texas Instruments; secretary-treasurer—Charles C. Batterson, Western Union Telegraph Co.

Plans were formulated for an early resumption of regular activities.

Montgomery—Pictured during the August meeting which featured a program on SAGE, are, left to right: Col. P. D. Brown, Director of Operations, Air Command & Staff College, Maxwell AFB; Col. Sterling Briggs, Director of C-E, Montgomery SAGE Installation; Sidney W. Reese, Alabama Chief Engineer, Southern Bell T&T Co., and Lt. Col. Herbert Herman, chapter president.

Northwest Florida

Chapter officers elected for 1958-59 are: President—Lt. Col. LeRoy T. Souders, Hq. APGC, Eglin AFB; first vice president—John F. Zwaska, Hq. APGC, Eglin AFB; second vice president—Capt. James A. McMullen, Eglin AFB; secretary-treasurer—Ray L. Atkinson, PGOVC, Hq. APGC, Eglin AFB.

Paris

Major General Victor Conrad, Signal Officer, SHAPE, was chosen chapter president during the recent annual election of officers.

The other officers are: First vice president—Rear Admiral H. C. Bruton, EUCOM; second vice president—A. DeBondini, Automatic Electric Int'l Inc.; third vice president—Major General C. Rodney Smith, G.E.T.T.E.; honorary vice presidents—Dr. E. M. Deloraine, ITT Corp.; G. Rabuteau, L.M.T.; Maurice Jean, C.F.T.H.; Vice Admiral Maurice Conge, C.C.T.U.F., and Dr. Maurice J. H. Ponte, C.S.F.; past president—Brigadier General Frank W. Moorman, U. S. Army attaché, France.

Directors: Col. Arian H. de Goede, General Electric Co.; Brigadier General Charles M. Baer, SHAPE; Joseph R. Pernice, Collins Radio Int'l Corp.; Col. William E. Heltzel, A.L.F.C.E.; Col. John Hessel, NATO; Georges P. Chevigny, I.S.E.; Marcel V. Laveran, C.F.T.H.; Maurice Vidrequin, T.R.T.; Roger A. Aubert, C.S.F., and Louis Henry, S.A.T.; secretary-treasurer—Lt. Col. Russell A. Duke, American Embassy.

San Diego

The chapter reports that one of its most interesting and popular meetings took place on August 6th at the Mt. Laguna USAF Radar Station with the 751st AC&W Squadron as host. Feature of the evening was a guided tour of the installation.

Preceded by dinner at the Pine House at this mountain-top community, fifty miles from San Diego, the meeting included informative talks by Lt. Col. Sullivan, Commanding Officer, and Maj. Donald Mercier, C-E Officer and a member of the chapter, and a program presented by their radar, communications and operation officers.

San Francisco—Pan American Airways hosts are shown with chapter officials at the July 31st meeting. Left to right are: M. F. Callen and G. R. Elliott of PAA; Col. J. aBennett, chapter director; C. L. Wickstrom, former chapter president; Cmdr. H. M. Anthony, chapter director; V. N. Williams, PAA; Chapter President T. D. Razovich; T. H. Taylor, R. A. Arvidson and R. M. Fleming, PAA.

San Francisco

On July 31st, Pan American World Airways, Inc., entertained the chapter at their base adjoining San Francisco International Airport. Chapter President Tom Razovich of Don Lee Broadcasting System introduced Pan American's V. P. "Bill" Williams, the principal speaker of the evening, who described the Pan American communication layout, which is quite elaborate.

Also participating in the program were five Pan American section chiefs who discussed the following subjects: R. A. Arvidson, Aeronautical Communications; R. H. Taylor, Radio Navigation, M. F. Callen, Leased Communications Services; R. M. Fleming, Aircraft Radio Engineering; G. R. Elliot, Aircraft Radio Maintenance.

Pan American was host at a delicious flight dinner served to over 200 chapter members and guests. After dinner, they were conducted on tours of the extensive communications facilities, the radio maintenance shops, the aircraft maintenance shops and a Pan American Clipper aircraft.

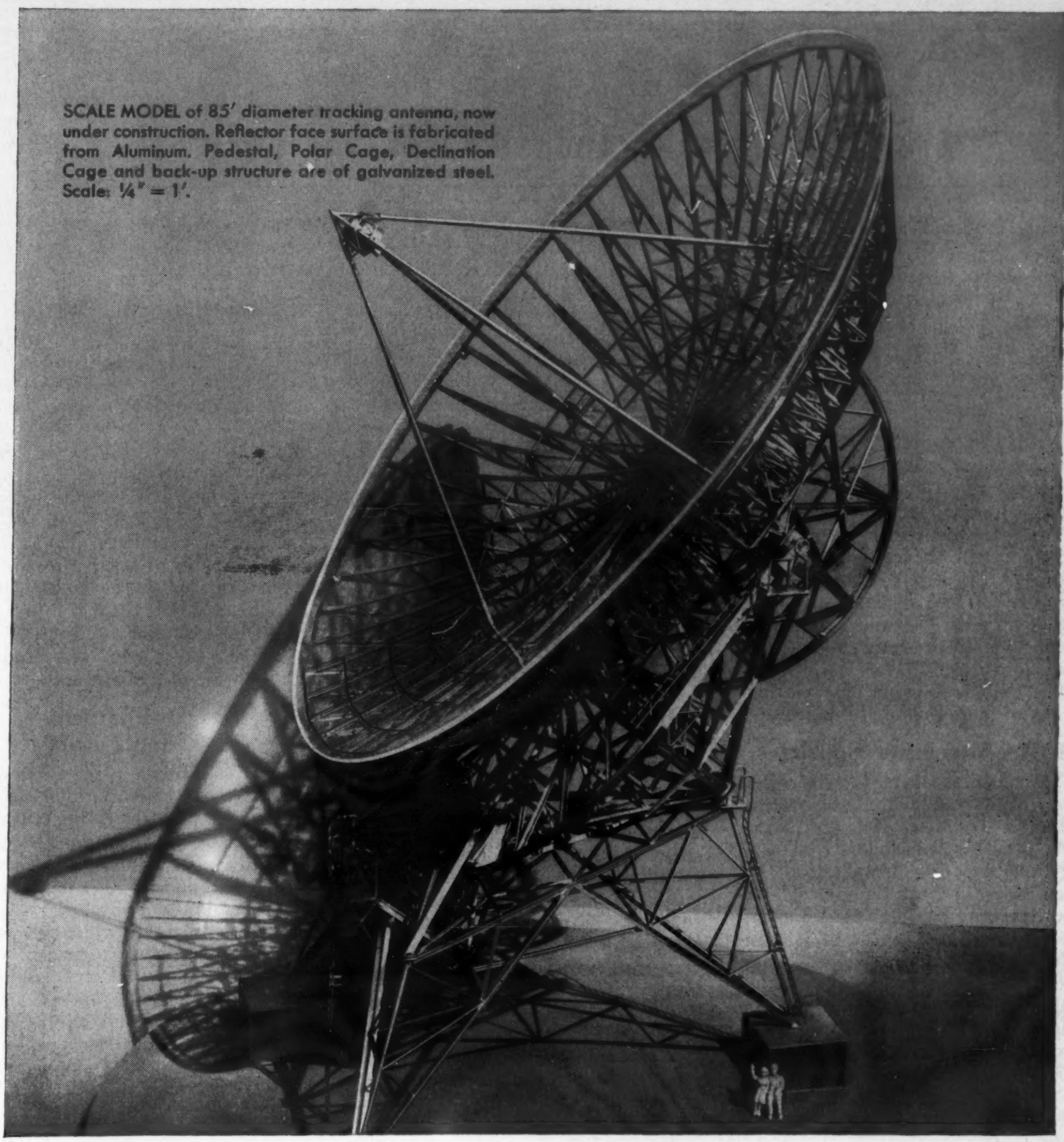
South Carolina

The Board of Directors and Committees of the chapter held a luncheon meeting at the Officers' Open Mess at Shaw Air Force Base on July 29th for the purpose of formulating plans for the 1958-59 fiscal year.

The following Committee Chairmen were appointed: Membership—William F. Reilly, Charleston Naval Shipyard; Armed Forces—Lt. Col. James R. Martin, Myrtle Beach AFB, with the following named to serve on this committee: Lt. Col. John C. Posey, Shaw AFB; Lt. Col. Marshall F. Crispen, Shaw AFB; Lt. Col. Earl R. Buckley, Jr., Shaw AFB; Lt. Col. H. E. Novinger, Shaw AFB; Lt. Col. Robert J. Green, Shaw AFB, and Capt. John H. Rains, Jr., Donaldson AFB; Industrial Relations—L. B. Woodard, Southern Bell T&T Co., Columbia; Publicity—H. E. Simpson, Southern Bell T&T Co., Columbia; Program—J. E. Butterworth, Southern Bell T&T Co., Columbia; Finance—Lt. Col. Robert J. Green, Shaw AFB.

Those present were: W. O. Kiger, president; Col. H. N. Sturdivant, first vice president; F. L. Davis, secretary-treasurer; Capt. J. H. Rains, Jr., director; Lt. Col. J. R. Martin, L. B. Woodard, H. E. Simpson, J. E. Butterworth, Lt. Col. R. J. Green, Lt. Col. J. C. Posey, Lt. Col. M. F. Crispen, Lt. Col. E. R. Buckley, Jr., and Lt. Col. H. E. Novinger.

Plans were made for joint sponsorship of a meeting on October 10th with the University of South Carolina Engineering Department, AIEE, and local radio and television stations. Feature speaker will be Cyril N. Hoyler, Manager, Technical Relations Department of RCA, who will present a lecture-demonstration on new adventures in electronics entitled "Electronic Music Synthesizer."



SCALE MODEL of 85′ diameter tracking antenna, now under construction. Reflector face surface is fabricated from Aluminum. Pedestal, Polar Cage, Declination Cage and back-up structure are of galvanized steel. Scale: ¼″ = 1′.

New Blaw-Knox 85′ Diameter Tracking Antenna

This newest Blaw-Knox 85′ Diameter Tracking Antenna will be part of a telemetering operation connected with missile and satellite development.

Its design is fully determinate. All structural members of the assembly are analyzed for stress and deflection before fabrication. Coupled with shop fabrication and field erection to rigidly accurate tolerances, it is capable of the highest gain, with a minimum of distortions or aberrations.

The entire drive system embodies such critical design requirements as infinitely variable movement with negligible creep or overrun for tracking. The slewing drives are capable of the extremely rapid acceleration and deceleration necessary to focus on supersonic targets.

Pioneering like this is the latest step in a long series of Blaw-Knox developments. Such milestones as the Guyed Vertical Radiator design in AM radio, the first radar antenna used to bounce signals off the moon, and the Tropospheric Scatter Antenna for over-the-horizon television have marked Blaw-Knox as a world leader in advanced design, fabrication and erection techniques.

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ITEMS OF INTEREST

From Government, Industry and the Services

Piccard's Craft Sold to Navy

The office of Naval Research recently purchased the famous Piccard Bathyscaph Trieste from the Swiss scientists Auguste and Jacques Piccard.

The 70-ton diving craft will soon explore the ocean depths off the Southern California coast for the Navy. It will be used for acoustical and biological investigations in the San Diego area.

The equivalent of a lighter-than-air craft, the Bathyscaph consists of a 50-foot hull, 12-feet in diameter, filled with 28,000 gallons of gasoline. A sphere 6.5 feet in diameter is suspended beneath the hull and easily accommodates two men and scientific equipment.

The craft is capable of exploring depths of more than three miles.

MARS November Speakers

November speakers for the First Army Military Affiliate Radio System (MARS) Technical Net (SIGNAL, Sept., 1958) will include:

November 5: "Application of Transistors in SSB Equipment" by Tom Stewart, Engineering Manager, The Hallicrafters Co.

November 12: "Ionospheric Storms and Their Effect on Radio Communications" by Luther C. Kelley, Project Engineer, U. S. Army Signal Radio Propagation Agency.

November 19: "The Engine Scope" by Gene Ecklund, Manager Automotive Equipment Sales, A. B. DuMont Labs.

November 26: "Compatible Single Sideband" by Leonard Kahn, President, Kahn Research Labs.

The talks will be held on Wednesday at 9 PM EST on 4030 KC. upper sideband.

M.I.T. Forms Firm

The Massachusetts Institute of Technology has formed The Mitre Corp., an organization to provide the Air Force with scientific and engineering services on problems concerning air defense.

A non-profit organization, the M.I.T. sponsored firm will provide the technical and systems support required for the integration of air defense systems. In this connection, the corporation will assist and work with the newly formed Air Defense Systems Integration Division of the Air Force. This is a tri-command unit organized early last spring at L. G. Hanscom Field, Bedford, Mass.

The group, known as ADSID, represents Air Research and Development Command, Air Material Command and Air Defense Command.

Device Uses Light From Stars

With the aid of light obtained from the stars, a new night vision device will enable troops to see military objectives at night, according to an announcement by the Department of the Army.

Known as the "Cascaded Photosensitive Image Intensifier," it was developed by the U. S. Army Engineer Research and Development Laboratories, Fort Belvoir, Virginia, and Radio Corporation of America, Harrison, New Jersey.

The new development, differing from other night vision devices which utilize infrared, radar and other mediums, gathers the reflected starlight or diffused light from "skyglow" falling upon the objective. It then intensifies or amplifies the diffused light sufficiently to present a distinguished image. The device is free from the complexities associated with low level light intensifier television systems and requires no source of artificial light or radiation.

With this new development, it will be possible to see at tremendously increased ranges objects which would otherwise be obscured by darkness.

Heart of the instrument is a cascaded image tube, actually two tubes working in a series and operating through an optical system which focuses the light reflected from objects in the field. The first tube acts as preamplifier for the second which in turn further amplifies or intensifies the light and presents the image on the viewing surface. The tube is powered by current at approximately 25,000 volts, furnished by a compact six-volt battery through a system of transformers and transistors.

Possible civilian uses for the tube include: (1) its installation on an astronomical telescope to extend its range and sensitivity, (2) in the making of certain x-rays using a substantially reduced level of radiation, or (3) viewing of minute flashes of light emitted by nuclear particles, thereby giving scientists a better understanding of their behavior.

Largest Rocket Motor

The Army's Redstone Arsenal in Huntsville, Ala., recently was the scene of the first ground test of the largest rocket motor developed in the U. S.

Officials reported the motor, burning a solid propellant, developed a thrust of "several hundred thousand pounds for a very short duration."

The Army announced that it is "a booster capable of hurling an air-defense missile to a very high altitude almost instantly."

The booster motors of both the Atlas and Polaris are "far exceeded" by the thrust of the new unit.

Servomechanisms Awarded Funds

Additional funds in the amount of $101,672 have been awarded the Research Laboratory of Servomechanisms, Inc., by Douglas Aircraft Company. The additional money is for SMI's continued research into the fields of solid-state physics.

The new materials which are being created at the laboratory can withstand extremely high temperatures. The major areas of work are in the fields of direct conversion of heat to electricity and the evaporation of functions for digital computers.

Servomechanisms, Inc., designs and produces advanced electronic and electro-mechanical subsystems and components for the aircraft, missile and astronautics industry.

Speakers at ARRL

The 10th National Amateur Radio Convention of the American Radio Relay League was held in Washington, D. C., at the Sheraton-Park Hotel, August 15-17.

Feature of the first day's meeting and luncheon was the military session which featured appearances or messages from Brigadier General John B. Bestic, USAF, Lieutenant General James D. O'Connell, USA, Chief Signal Officer and Rear Admiral Frank Virden, USN, Director, Naval Communications.

General Bestic, USAF: "Like all citizens we share in the nation's

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gratitude to those of you who have provided disaster communications during times of national emergency. The record of achievement compiled by amateur radio during flood, hurricane and tornado emergencies will forever place the public in your debt . . . and amateur radio operators are considered a part of our national defense stockpile. . . .

"Amateur radio operators are by tradition generous with their skill and time. Your Air Force recognizes the tremendous pool of technical knowledge made available to us through amateur radio. We are justly proud of our Air-to-Ground Single Sideband program now operational in the Strategic Air Command. Thanks to the skill and cooperation of competent amateurs who have followed our world-wide test flights, highly valuable data from amateurs all over the country allowed a complete flying test program to be completed in record time."

General O'Connell, USA: "Although amateur operations are carried on as a hobby, the result is the creation of a large reservoir of personnel skilled in the art of radio communication. This has proved of value both to the nation in time of war and to industry in time of peace. All of us recognize the radio amateur's unique ability to enhance international good will. . . .

"From a humble beginning at the turn of the century, amateur radio has grown to become an established institution. Today the American followers of amateur radio number over 170,000 licensed trained communicators. From these ranks will emerge professional communications specialists, research and development personnel and the electronics executives of tomorrow. Just as many of today's leaders of the communications industry were first attracted through an intense curiosity and feverish pursuit of what they called wireless telegraphy."

Admiral Virden, USN, incorporated the current Navy policy on amateur radio in his talk. It reads: "It is the policy of the Department of the Navy to support and encourage amateur radio activities, and not to engage in an action which would tend to jeopardize the independent status and the prerogatives of the amateur radio operator. Close liaison should be maintained with amateur radio organizations and individual amateur radio operators in planning and practicing for emergency communication service in the event of local emergencies or disasters, too."

Admiral Virden also said: "From the spark days to satellites the amateurs have kept pace with the progress of communications and contributed greatly to this rapid advancement. They have even kept ahead of it and led the way quite often to new developments. Those of you that are interested in the technical advancements of communications are entering an era of monumental challenge."

Mr. George Bailey, Past President and Director of AFCEA, was the toastmaster. He is also a past president of ARRL.

New Anti-Sub Helicopter

A new anti-submarine helicopter, the Navy HSS-2, has been developed. The Navy and Sikorsky Aircraft Division of United Aircraft Corp. made the joint announcement.

The Navy stated it is a "substantial advance" over the current anti-submarine helicopter, the HSS-1, which is also used by the Army, Marines and as a commercial craft.

The new helicopter has two General Electric Co. T58-6 gas turbine engines mounted side by side above the fuselage.

Designated the S61 by Sikorsky, it employs a flying boat hull and has all weather flight capabilities.

Michael E. Gluhareff, Sikorsky engineering manager, said the experimental model of the HSS-2 is under construction at Stratford, Conn., and will make its first flight next year.

Names in the News

Dr. W. R. G. Baker has been elected to the board of directors of Gulton Industries, Inc. Dr. Baker is vice president of Syracuse University for Research and president of Syracuse University Research Corporation.

William J. Bivens, former chief, Legal Division and advisor to the Commanding Officer, Mid-Western Regional Office (MRO) of the USA Signal Supply Agency, has accepted a position as attorney-advisor in the Office of the Chief Signal Officer.

Joseph L. Weis has been appointed Director of Engineering Marketing of General Communication Company. Previously, he was a Technical Director and Vice President.

Colonel Albert J. Mandelbaum, USA, formerly on the staff of the Supreme Headquarters, Allied Powers Europe, in Paris, France, recently assumed the post of Signal Officer, Fifth U.S. Army, at the Army headquarters in Chicago.

Edward F. Metzger, assistant chief, Bureau of Supplies & Accounts, has been named Rear Admiral.

David P. Gibbs, commander of the U.S. Army Signal Training Center at Fort Gordon, Georgia, has been promoted to Brigadier General. Prior to his present assignment, he served as Signal Officer of the Continental Army Command at Fort Monroe.

General James H. Doolittle will become Chairman of the Board of Directors of the Space Technology Laboratories. General Doolittle assumes his new position on January 1 when the Laboratories, formerly a division of Ramo-Wooldridge, will become a separate corporation.

Ivan Sattem, John E. Kahelin and J. Eugene Bower have been elected assistant vice presidents at ITT Laboratories, United States research division of International Telephone & Telegraph Corp.

Ralph E. Grimm has been named to the post of Director of Engineering for Nems-Clarke Company, a subsidiary of Vitro Corp. of America. He was chief of the development laboratory for the company.

Dr. Howard T. Engstrom has returned to the Remington Rand Univac Division, Sperry Rand Corporation, as Vice President and Director of Marketing of Univac scientific and military systems after serving as deputy director for the National Security Agency.

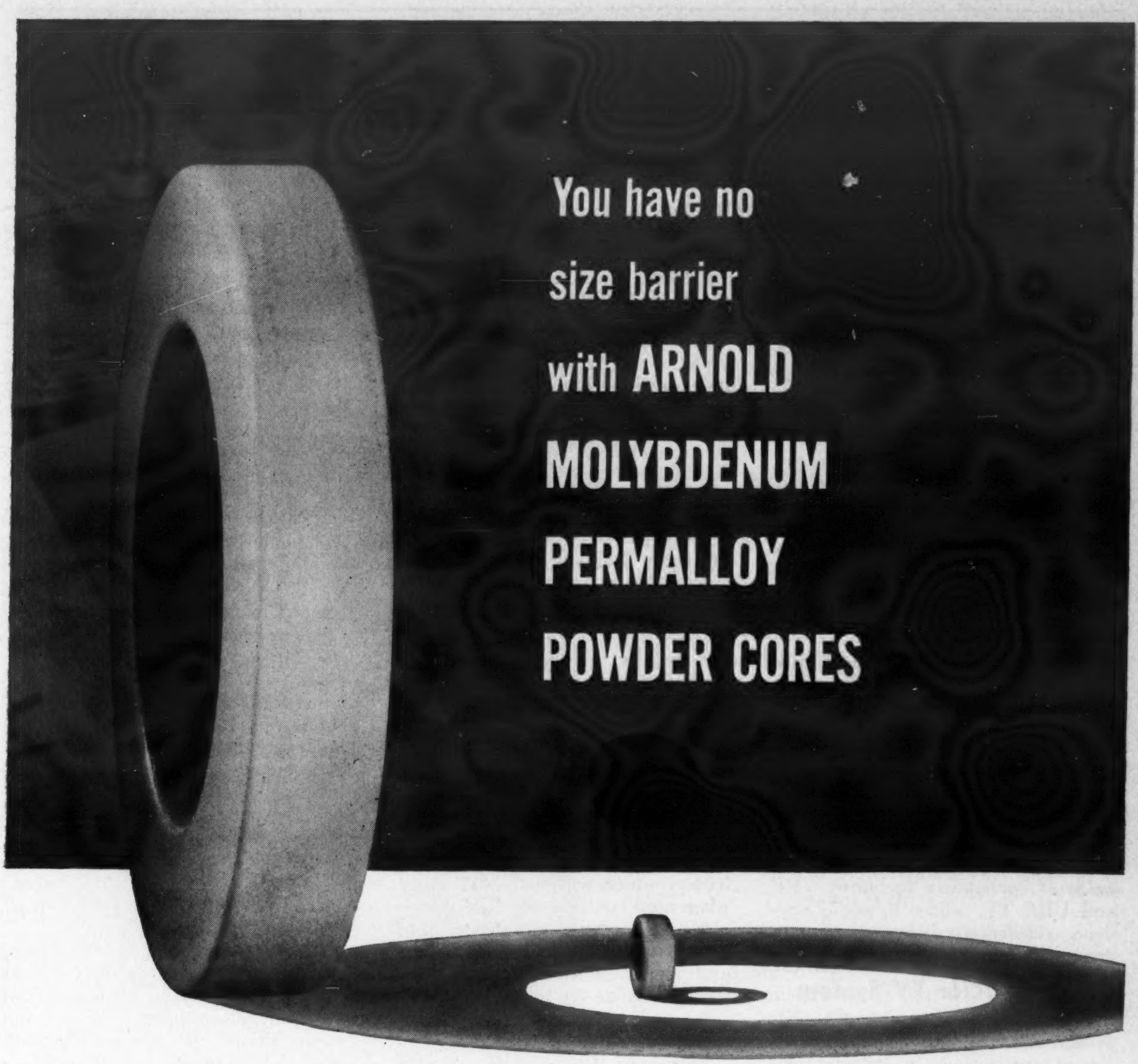
Dr. Joseph A. Boyd, professor of electrical engineering, has been appointed Director of the Willow Run Laboratories of The University of Michigan. A principal research activity of the Laboratories is Project MICHIGAN, an Army-sponsored advanced research program on combat surveillance.

Paul Strum has been appointed manager of Military Marketing for Motorola's Military Electronics Division. Mr. Strum was previously manager of the Washington office for Military Marketing.

Colonel Joseph P. Ahern, Signal Corps, is assuming command of the United States Army Signal (Corps) Supply Control Agency, Maison Fort, France.

Brigadier General Terence J. Tully, USA (Ret.), has been appointed Manager of Communications Engineering, RCA Service Company Missile Test Project, Patrick Air Force Base, Florida.

Rear Admiral Jack S. Dorsey has been named Deputy Director for Communications-Electronics, Joint Chiefs of Staff.



Starting with the smallest up to the largest, Arnold leads the way in offering you a full range of Molybdenum Permalloy Powder cores for greater design flexibility . . . from 0.500″ O.D. to 5.218″ O.D.

As long ago as 1953 Arnold pioneered and developed for production use the small "Cheerio" core illustrated above. Today, hundreds of thousands of Arnold "Cheerio" cores are filling the requirement for miniaturization in circuit design in industrial and military applications. And even smaller sizes have been developed by the Arnold Engineering Company and are available.

Arnold also is the exclusive producer of the largest 125 Mu core commercially available. A huge 2,000 ton press is required for its manufacture and insures its uniform physical and magnetic properties. This big core is also offered in the other three standard permeabilities of 60, 26 and 14 Mu.

Most core sizes can be furnished with a controlled temperature coefficient of inductance in the range of 30° F to 130° F. Many can be supplied temperature stabilized over the wide range covered by the MIL-T-27 specification of −55° C to +85° C . . . another of the special features only Arnold provides. ● Let us handle all your magnetic materials requirements from the most extensive line in the industry: Powder cores, tape cores, cast or sintered Alnico permanent magnets, and special magnetic materials.

WSW 6961 A

For more information write for Bulletin PC-104B

Lists complete line of Mo-Permalloy Powder cores . . . available in 23 sizes from 0.500″ O.D. to 5.218″ O.D. Furnished also with various types of temperature stability from Type "A" unstabilized to Type "W" stabilized over the temperature range of −65° F to +185° F.

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NEW PRODUCTS FROM INDUSTRY

Radar Range Extended

Zenith Radio Corp. of Chicago 39, Ill., has characterized their new wide-band, low-noise, high gain amplifier tube as "a scientific breakthrough that is expected to have tremendous impact on radar and space communications. The development, achieved in cooperation with Dr. Glen Wade of Stanford University, is specifically expected to extend the effective range of military defense radars used in distant early warning systems for detection of enemy aircraft, as well as the range of intercontinental missile and earth satellite tracking systems.

The unit and its auxiliary components form a "small package" that requires no refrigeration equipment and it may be used in connection with existing UHF and microwave receivers.

Since the amplifier has the ability to boost the signal in such a way that no significant noise is added, a major reduction in added noise significantly improves the performance of radio receivers, such as those operating on ultra high frequencies and microwave frequencies.

Work is underway on several versions of the tube for various other fields of application, including VHF and UHF TV, where it would produce substantial improvements in areas with marginal reception.

Portable Color TV System

A transistorized portable color TV system which is designed for closed-circuit applications in industry, defense, education and research has been developed by Radio Corporation of America.

Containing a 20-lb. camera with 3 developmental Vidicon pickup tubes plus a 45-lb. control and monitor unit, the new system approximately measures the size of a suitcase.

It was explained that the weight reductions were made possible through replacement of vacuum tubes with about 300 transistors, together with the use of miniaturized circuitry and smaller TV pickup tubes.

Speed Indicating System

A "versatile package that provides speed indication for almost anything that moves" describes the speed indicating system recently announced bv Servo-Tek Products Co., Inc., of 1086 Goffle Rd., Hawthorne, New Jersey.

The new system combines the company's d-c tachometer generator with an accurate 4½" panel-mounted meter so as to give full-scale speed indications ranging from 100 up to 12,000 rpm.

Generator and indicator are connected by a low voltage cable which can be 500 feet long without affecting system accuracy. No batteries, external power or periodic calibration are needed.

Selling for only $87.00, this system permits nearly every industrial process or machine to benefit by the economy and safety of continuous speed indication.

New Hearing Aid Weighs 1 Ounce

Containing the "world's smallest transistors," a new hearing aid that weighs only one ounce has been introduced by the Philco Corporation of Philadelphia, Penn.

The use of Philco M-1 transistors is claimed to guarantee high sensitivity and dependable performance together with making possible the small dimensions of the unit (about the size of a cigarette lighter).

Incorporated into the hearing aid is a dime-size, wafer thin mercury battery which will last about a week when used continuously for 12 hours a day. A high-performance amplifier said to provide undistorted sound and an invisible, custom-made ear piece complete the unit.

Microtubing

Monsanto Chemical Co. of St. Louis, Mo., has announced production of microtubing which is 3 one-thousandths of an inch in diameter—so small that it compares in size to a human hair.

Tentatively named Santotube Q, the tubing is made of quartz. Originally it was developed in fiber form for the Atomic Energy Commission, and used in the construction of microbalances. Further development resulted in Santotube Q, which is claimed to offer many desirable characteristics for industrial applications.

In addition to its tiny size (illustrated by the fact that a 50-foot length holds only a single drop of water), the tubing is flexible so as to permit knotting and has a greater tensile strength than steel. Moreover, it is said to be resistant to high temperatures, highly inert to chemicals and a nonconductor of electricity.

Exemplifying its industrial potential, the tubing is expected to play a prominent role in a new Bell Laboratories development for recovering upwards of 4-billion cubic feet of helium lost annually in natural gas.

New Method Chops Computer Time

A method jointly developed by the USAF's Air Materiel Command and the Remington Rand Div. of Sperry Rand Corp. permits a limited vocabulary of English verbs in the programming of business-type computers.

Known as Air Materiel Command Automatic Compiler (AIMACO), the new system uses only 30 English verbs, e.g., add, subtract, multiply, search, but can be expanded to add verbs as circumstances dictate. Instruction coding has not been eliminated, but rather, it too has been automated. To replace the manual translation from English to machine language, the new system simply uses a large-scale computer to make this conversion electronically, for itself and for other makes and models as well. The programmer job will be reduced in most instances to a clerical level, whereas top programmers will be elevated to the position of analyst.

Viewed as a major step in cutting computer time by virtually eliminating programmers on all but a small per cent of problems, the development allows the average business man to refer his accounting and computational needs to the machines in almost his own terms, without having to learn the complex language of the machine.

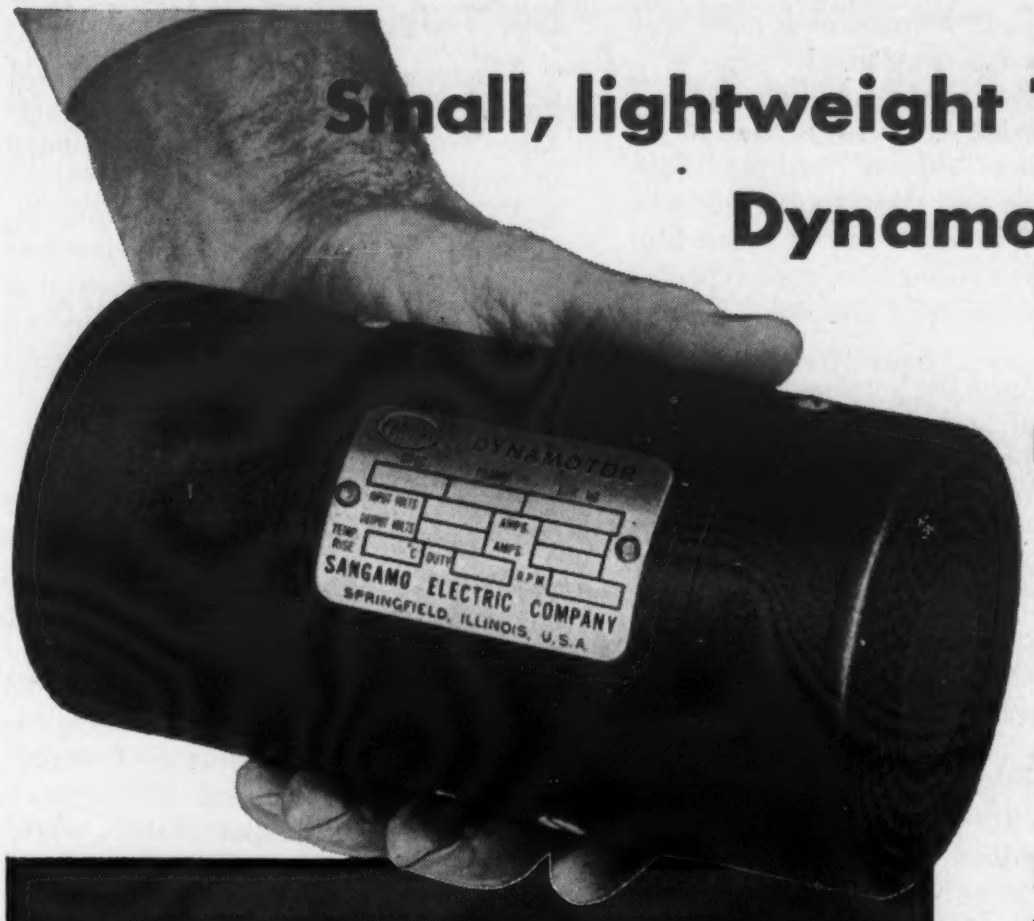
Presently in successful but limited use, AIMACO is expected to be in general operation at major AMC activities by the end of 1958.

New Telemetry Receiver Line

With the incorporation of phase-lock into their new crystal controlled telemetry receiver line, Nems-Clarke Company of Silver Spring, Md., has announced availability of features not present in any previous receiver. This line of 1400 Series Phase-Lock Receivers covers frequency ranges of 215 to 260 megacycles.

Phase lock improves data accuracy under weak signal conditions by lowering the receiver threshold and cre-

Small, lightweight Three Commutator Dynamotor for airborne transmitting and receiving equipment



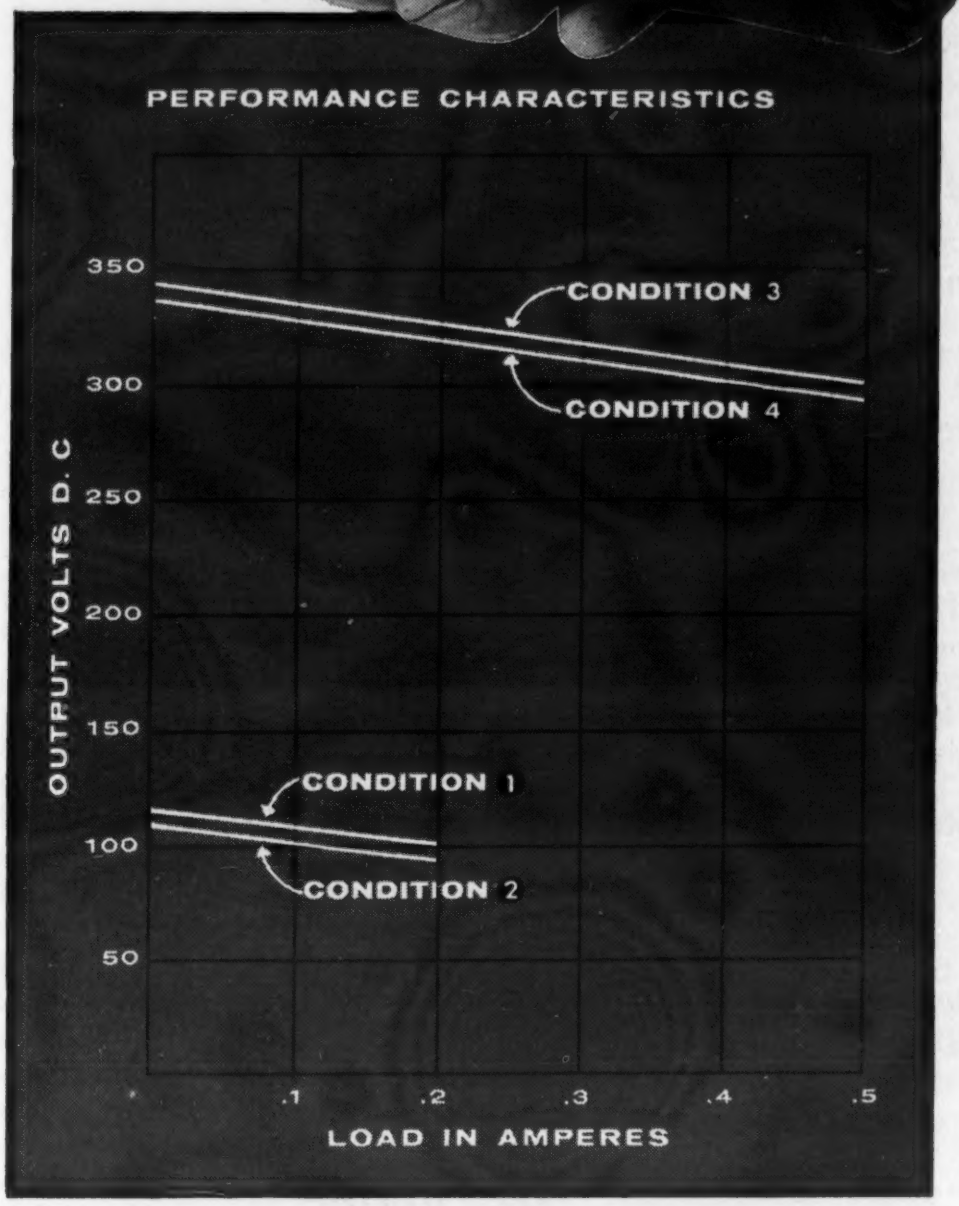
SANGAMO SP 17

(DUAL OUTPUT or DUAL INPUT)

Here is a "two-in-one" dynamotor that is small in size, light in weight, and highly efficient for both transmitting and receiving equipment. Its quality is consistent with MIL-D-24 specifications for aircraft, marine, and "Hi-Gee" (missile) usage.

	Weight	6 lbs.
	Diameter	3½"
	Length	7"
Typical Rating:	Input 26 volts at 10 amperes Output A 100 volts at .200 amperes Output B 300 volts at .500 amperes Temperature rise 30°C Ripple voltage 1% maximum	

Performance characteristics of the SP17 are shown in the chart at left.



SP17 DUAL OUTPUT

CONDITION ❶ = Output A with no load on B
CONDITION ❷ = Output A with full load on B
CONDITION ❸ = Output B with no load on A
CONDITION ❹ = Output B with full load on A

SANGAMO GY-25 "TWINVOLT"

This dynamotor, originally designed for mobile communications equipment, operates at full efficiency at either 6 or 12 volt input, but can be either dual input or dual output. Maximum output 180 watts, intermittent duty.

Write for full information, or for engineering help with your power planning. Sangamo's engineering staff will be glad to assist you.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

SG58-1

ating an over-all improvement in signal-to-noise ratio. Since this type of correlation detection allows all of the factors which influence the desired bandwidth to be considered and optimized in the design of the demodulator, the effective noise bandwidth of the receiver can be reduced to only that value necessary to receive the information rate.

In the case of IRIG FM/FM telemetry using standard receivers of 500 kc bandwidth, the noise bandwidth can be reduced by a factor of approximately 2.5 when all subcarriers are used, resulting in a theoretical improvement of nearly 7.96 db both in reduction of receiver threshold and in improved signal-to-noise ratio above threshold.

High-Speed Data Transmission

Collins Radio Co. of Cedar Rapids, Iowa, is marketing a new high-speed data transmission system. When used with the company's Kinecard Converter and IBM card reader/punch unit, the system produces and transmits punch card information at a rate of 100 cards per minute.

Completely transistorized, the new unit conveys information at voice frequencies over wireline, cable, carrier or microwave telephone facilities.

New "Mylar" Cables

"Mylar" film has already become well-known as a base for magnetic recording tape and as a dielectric layer in high quality capacitors. But U. S. Plastic Rope Corp. of 2581 Spring St., Redwood City, Calif., is using DuPont "Mylar" polyester film to make a new stretch-controlled cable which is claimed to perform such varied functions as supporting Stanford Research Institute's giant scatter propagation antenna and as serving as an almost impervious core for high-power transmission cable.

U. S. Plastic's development of a patented machine permits the forming of fine "Mylar" ribbon into threads that are then spun into conventional 3-strand rope or cable-laid types—said to be more than twice as strong as manila of the same diameter.

Having a high resistance to impact, chemical agents or solvents, as well as excellent dielectric properties and high temperature stability, "Mylar" rope has found highly satisfactory application in the marine, chemical, food processing and construction industries. Many new uses are also expected in the electronics industry due to its excellent electrical properties. Unlike steel guy wire, "Mylar" does not change an antenna pattern in any way.

All standard rope sizes from 1/8" to 1" are in production in bulk coils and special application ropes are also provided.

Mechanized Oracle

Sibyl, a computer-like machine that simulates a variety of communication devices and systems to permit testing customer reaction with no expense involved of building special equipment for test purposes, has been developed by the Bell Telephone Labs., New York City.

The machine will be linked to new developments in the communications field which will appear to be the real thing but which will have no special instrumentation within their shells. Instead, the test instrument will be connected with Sibyl which will perform functions of a special switching system or any other operations required by the new developments.

In providing objective data as to how telephone users will respond to a new service Sibyl can collect data on how a call was placed, such as the date, time, originator, speed of operation, errors, etc. However, the privacy of conversations will be preserved and the intervention of Sibyl will not inconvenience the user in any manner.

The device has 3 coordinated sections: a main machine similar to a computer which can be programmed to simulate the functions of a proposed service under realistic conditions, a second section with read-out equipment of conventional design, and an operator console.

Bell Labs' engineers and psychologists hope to predict from data collected by Sibyl whether a new facility will be useful and attractive from the customer's viewpoint.

UK Telegraphic Tape Unit

A new self-contained machine that handles high-speed punched tape messages for telegraphic traffic has been developed by Automatic Telephone & Electric Co., Ltd., 8 Arundel St., London. It is claimed to occupy less operator's space than conventional leads, to provide flexibility under all operating conditions, and to permit maximum loading of several circuits by one operator.

Designated Tape Reading, Autosending Equipment, Series TAA, the device automatically numbers the messages while enabling routine traffic to be made available without the punching of special tapes.

Two units comprise the equipment; one incorporates the tape reading leads and all functional controls, while the other consists of the associated electronic distributor which may be mounted remotely.

Transistorized Portable TV

A fully portable transistorized TV set and two palm-sized radio transceivers have been developed by the Semiconductor-Components Div. of Texas Instruments, Inc.

Measuring 3 x 5 x 1½ inches, the transceivers are voice modulated and have Type 8A3 emission on 27.51 mc. They use a crystal tuned transistor oscillator driving transistor output stage. New 2NYWE diffused base germanium transistors are capable of 90 mc. alpha cutoff current. Five transistors are incorporated in the transceiver.

Special license was granted by the FCC for their operation as station KB-7184 during the Western Electronic Show and Convention.

Fully portable, the transistorized television set requires only self-contained rechargeable batteries and uses commercially available transistors; 24 transistors are used, along with 2 tubes—a picture tube and a high-voltage rectifier which was not replaced by semiconductor rectifiers since it did not distract from the small size or portability of the set.

New British "STRAD" System

A recently announced electronic communications system, designed to make a "decisive reduction in the time required to handle the many telegraph messages that are vital to the control of modern aircraft," has been opened at the Gatwick Airport in Great Britain.

Developed by Standard Telephones & Cables, Ltd., the new system was described as "one of the most important advances in its field for years."

The STRAD retransmission system (switching, transmitting, receiving and distribution) was said to perform all the functions of a conventional manual relay center. All the message relaying operations, however, are carried out electronically, with routing performed manually by push-button circuits. While the system is currently semi-automatic, it was explained that its operation can be easily converted to a fully automatic status.

New Literature

New Foreign Technical Information Center

Secretary of Commerce Sinclair Weeks has announced the services of a new Foreign Technical Information Center, to operate within the U. S. Dept. of Commerce as a division of its Office of Technical Services. The new center will provide American science and industry with access to translations of a large amount of Soviet technical information.

Services include publication of abstracts of all articles appearing in 141 Soviet technical journals, translations of important sections of *Referativnvy Zhurnal* (the Soviet abstract journal), and a semi-monthly review of various areas of Soviet science compiled by the CIA. Abstracts of each issue of the 141 journals may be purchased from OTS on subscription or single-issue basis, as may CIA's *Scientific Information Report.* Although various sections of *Referativnvy Zhurnal* will be sold initially by single issues, a subscription offer may be available later.

Director of OTS John C. Green stated that OTS will soon begin distributing complete translations of articles and books, all of which are being listed in an abstract journal to be published this fall.

Much of the material collected by OTS will be from government sources, principally the intelligence agencies. This volume is presently estimated to run at 50,000 abstracts and 10,000 complete translations annually.

New "Space" Journal

Entitled "Space Age," a new publication appeared on the scene August 20. Published by Quinn Publishing Co. of Kingston, N. Y., the magazine is being edited by Martin Caidin who recently won the James J. Strebig Memorial Trophy as the outstanding aviation book author of 1958. *War For The Moon* and *Countdown For Tomorrow* are two of Mr. Caidin's popular works on rockets, missiles and astronautics.

Lead article in the first issue was "The Russian Conquest of Space," written by editor Caidin, which blueprinted the Soviet missile program and presented reasons why "shooting for the moon" is considered the key to world military domination.

AEC Engineering Materials Available

The Atomic Energy Commission has announced a new plan for making its engineering materials, i.e., drawings, etc., available to the general public. Under contractual arrangements with the AEC, the sale of such engineering materials in a variety of full and reduced size forms will be conducted by the following commercial organizations: Cooper-Trent Blueprint & Microfilm Corporation of 2701 Wilson Blvd., Arlington, Va.; Rapid Blueprint Co., of 818 Santee St., Los Angeles, Cal.; University Microfilms, Inc., of 313 N. 1st Street, Ann Arbor, Mich.

Effective with the issuance of this announcement, the public sales service formerly conducted by the Technical Information Service Extension, Oak Ridge, Tenn., was discontinued. However, a revised *Engineering Materials List* (TID-4100, 1st Rev.), dated May 1958, and its Supplements, are available without charge from the Technical Information Service Extension, P. O. Box 62, Oak Ridge, Tenn.

Inquiries regarding availability of engineering materials not announced in the *List* should be sent to the above address, whereupon TISE will attempt to obtain the desired materials and will inform the requestor of availability through the commercial sources cited above.

Comprehensive Relay Catalog

A new 100-page catalog, "Relays and Switches for Industrial Control," has been prepared by Automatic Electric Company to provide quick and easy reference to the company's full line of telephone type relays and rotary stepping switches for industrial control applications.

Including over 200 photos, drawings, mounting diagrams, circuits and charts, the catalog's general information on relays and switches provides a useful source of reference data for the circuit engineer.

The catalog may be had, free of charge, from V. E. James, Mgr., Industrial Control Equipment Sales, Automatic Electric Sales Corp., Northlake, Ill.

Proceedings of the IRE

looks into outer space with RADIO ASTRONOMY

January 1958 Special Issue

RADIO ASTRONOMY is responsible for a rich harvest of new information about the sun and certain solar phenomena, meteors and meteor showers recorded in broad daylight, the galaxy of stars of which our own sun is a part, and other galaxies infinitely distant from us. Regions of the universe invisible to the eye and the photographic plate can now be seen via their measurable radiation at radio wave lengths. New developments in antennas, propagation, low-noise receivers and the ionosphere are occurring because of progress in radio astronomy.

Here is the revolutionary technique which is carrying us to uncharted regions of the universe. Discoveries in this field during the last decade have created another vitally important branch of science.

PAPERS BY KARL JANSKY in issues of PROCEEDINGS OF THE IRE during the early 1930's first reported the existence of radio waves emanating from outside the earth's atmosphere . . . now PROCEEDINGS publishes the first full discussion of radio astronomy, its current state and future prospects, written by the leading authorities from all over the world.

Special January Issue Contains Nearly 400 Pages Summarizing All That Is Known About Radio Astronomy

"On Karl Jansky" by C. M. Jansky, Jansky & Bailey.

"Recollections of Early Experiments in Radio Astronomy" by G. Reber, Hawaii.

"Radar Echos From the Moon at a Wave Length of 10 cm" by B. S. Yaplee, et al, N. R. L.

"Excitation of the Hydrogen 21 cm Line" by G. B. Field, Princeton.

"Extra Galactic 21 cm Line Studies" by H. S. Heeschen, Greenbank Nat. Obs., N. H. Dieter, Harvard.

"Radio Stars and the Milky Way at 440 mc" by N. G. Roman & B. Yaplee, N. R. L.

"A High Resoluti[illegible] Telescope for Use at 3.5 M" by B. Y. Mills, et al, Austra[illegible]a.

"The Sydney 19.7 Mc/s Radio Telescope" by C. A. Shain, Australia.

"Radio Telescope Antennas of Large Aperture" by J. D. Kraus, Ohio State.

"An Antenna Array for Studies in Meteor and Radio Astronomy at 13 Meters" by P. B. Gallagher, Stanford U.

"A Wide Band Antenna System for Solar Noise Studies" by H. Jasik, Jasik Labs.

"Radio Interferometry of Discrete Sources" by R. N. Bracewell, Stanford U.

"A Polarimeter in the Microwave Region" by K. Akabane, Tokyo Obs.

"The Cornell Radio Polarimeter" by M. H. Cohen, Cornell.

"10.7 cm Solar Radio Flux Measurements" by W. J. Medd & A. E. Covington, Canadian Res. Council.

"Absorption Techniques as a Tool for 21 cm Research" by A. E. Lilley & E. F. McClain, Yale.

"Lunar Thermal Radiation at 35 KMC" by J. E. Gibson, N. R. L.

"Planetary and Solar Radio Emission at 11 Meters Wavelength" by J. D. Kraus, Ohio State.

MORE THAN 45 ARTICLES IN ALL

Proceedings of the IRE

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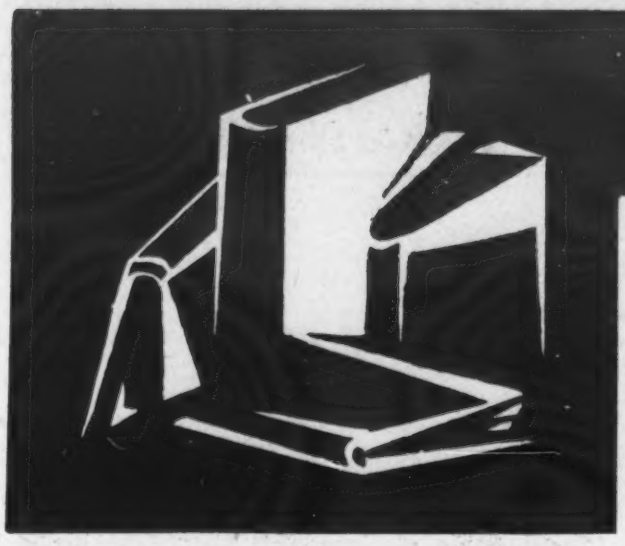

Books

WAR AND PEACE IN THE SPACE AGE, by Lt. Gen. James M. Gavin. Harper & Brothers, New York. 304 pages, $5.00.

From time to time a re-appraisal of our military situation is just as much a necessity as a published report on the nation's economic condition. When such an exposé of facts is published for general consumption, the pros and cons of the issues expressed reach to the limit of outer space.

Precisely, this is what happened when General Gavin's book reached the reading public. True, his opinions are personal, but they make sense to the layman who moves forward to his own analysis of how our military defense program should or should not be guided. This personal approach is understandable when one considers that self-preservation ranks high on the list of human existence—be it in war or peace. A lot of what General Gavin has to say exemplifies the personal ego of the man himself.

On the other hand, he brings forward meaningful problems of our national defense posture for constructive perusal, examination and evaluation. Most military men can readily agree as well as disagree with his opinions. It all depends on the point of departure in their thinking, having already established a basic military foundation based on years of practical and educated experience in strategic and tactical doctrine. As for the layman, he is in a position to make his evaluation based on what he thinks our present and future military policy should be, without a controlling military influence. General Gavin himself has established a solid military foundation, and his particular line of departure is what makes *War and Peace in the Space Age* interesting reading.

The book is provocative and, after wading through a series of essential facts as they relate to our present defense position vis a vis the Soviet Union and the missile and space age, the reader finds his time has been well spent. The author has confronted him with problems which challenge his own appraisal of today's events—events that demand considered thought and decision.

HISTORY OF MATHEMATICS, by D. E. Smith. Dover Publications, Inc., New York. 2-volume set, $5.00; individual volumes, $2.75.

Spanning the historical drama about the makers of mathematics from the time man first began to use his fingers for counting, up to his mastery of the abstractions of the infinitesimal calculus, D. E. Smith's newly reprinted, 2-volume history offers an excellent reference work as well as a storehouse of interesting facts.

What reader would not be intrigued with a discussion relating to the fact that the word "algebra" in 16th century England also meant bonesetting; that our division of degrees, hours, and minutes into 60 sub-units stems from Babylonia whose mathematics was based on 60; that although Omar Khayyam is known to the western world chiefly as the author of the *Rubaiyat*, he was one of the most important mathematicians of the 12th century; that the Maya Indians, in Central America, worked out place values and the concept of zero hundreds of years before these ideas arose in the Old World; that the Japanese had worked out a calculus independently of European mathematics in the late 17th century?

The complete work is divided into 2 major sections; a first volume is chronologically arranged by man and country while a second volume is compiled by subject, discussing the evolution of the different divisions of mathematics. The study includes the contributions of Thales, Pythagoras, Archimedes, Euclid, Descartes, Newton, Leibniz and Gauss, as well as the moderns.

ARTIFICIAL SATELLITES (Iskusstvennyye Sputniki), by A. Shternfeld. Moscow: State Publishing House of Technical-Theoretical Literature; U. S. A.: OTS, U. S. Dept. of Commerce, Washington, D. C. 433 pages, $6.00.

The 1958 edition of A. Shternfeld's book on artificial satellites, which was translated by the Technical Documents Liaison Office, Wright-Patterson AFB in Ohio, has been published by the Dept. of Commerce's Office of Technical Services.

Written for the scientifically inclined layman as well as the scientist or engineer, chapters of the new book are concerned with the law of motion of artificial satellites, the motion of the satellite relative to an earth observer, the satellite's rocket starter, its construction and its launching, man in cosmic space, life on board a satellite, observation of satellites and their communication with the ground, the descent to earth, artificial satellites of bodies of the solar system, and the varied utilization of artificial satellites.

In an appendix, author Shternfeld discusses the dissemination of the ideas of astronautics and the question of territorial rights to the space outside the atmosphere.

VOICE ACROSS THE SEA, by Arthur C. Clarke. Harper & Brothers, New York. 208 pages, $3.75.

Voice Across the Sea is the extraordinary story of how a handful of men, fortified with unbelievable courage and the stubborn persistence to carry them through over 8 years of trial and error, finally succeeded in laying a durable telegraph cable across the North Atlantic—a feat considered to be one of the great engineering epics of all time. Thereafter, with the closing of a switch, the gap between Europe and America shrank abruptly from a month to a second and, as a consequence, a whole new era of ever-improving communications was set in motion.

No intention is claimed by the author that this work be regarded as a complete history of submarine communications. Rather, his object to entertain as well as instruct is exemplified by the inclusion of the writings of some of the most brilliant Victorian journalists who covered the cable-laying operations from aboard the famous *Great Western*. Their eyewitness accounts of storms at sea, breaks in the cable and innumerable obstacles encountered during the expeditions provide fascinating sidelights. Moreover, the book is also a story of both the contributions and the eccentricities of several remarkable geniuses involved in the adventures, including financier Cyrus Field and scientists Lord Kelvin, Samuel Morse, Thomas Edison and Oliver Heaviside. With the exception of one technical chapter, the presentation requires little knowledge of electricity.

Completing the work is a chapter explaining how the modern submerged repeater has revolutionized transoceanic communications, together with one providing a glimpse of the still more extraordinary potentials opened up by radio links in earth satellites.

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